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ABSTRACT

The Cooperative Language Development Project studied the efficacy of the Initial Teaching Alphabet (ITA) in teaching beginning reading and the efficacy of the Peabody Language Development Kits in stimulating verbal intelligence, creative thinking, school achievement, and language development. In this monograph, a post-test and follow-up evaluation are carried out after the fourth grade. Pupil progress was measured in various areas of standardized tests, such as the Stanford-Binet Intelligence Scale and the Torrance Tests of Creative Thinking. In general, the results are that some gains (in IQ, for example) from the original three-year program were not lost in the following year. In spite of some substantial and statistically significant decrements during the follow-up year, the results are considered to provide some optimism about the effectiveness of both experimental reading methods. However, until more sophisticated procedures and measures are available, it is not considered feasible to engage in additional teaching method studies. [For the interim report "after two years," see ED 017 415.] (Author/JW)

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INSTITUTE ON MENTAL RETARDATION AND INTELLECTUAL DEVELOPMENT

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EFFICACY OF THE PEABODY LANGUAGE DEVELOPMENT KITS AND THE INITIAL TEACHING ALPHABET WITH SOUTHERN DISADVANTAGED CHILDREN IN THE PRIMARY GRADES: A FOLLOW-UP REPORT AFTER THE FOURTH GRADE

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by

Lloyd M. Dunn and Robert H. Bruininks

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Efficacy of the Peabody Language Development Kits and the Initial Teaching Alphabet with Southern Disadvantaged Children in the Primary Grades: A Follow-up Report After the Fourth Grade[1]

by

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The vast majority of boys and girls from our inner-city slums encounter inordinate barriers in achieving scholastic success. Academic problems are acute--particularly for disadvantaged children in the South. These pupils--especially Negro youth--bring to the schools a restricted and non-standard form of oral language which is often incompatible with existing instructional procedures. Generally, they neither hear nor articulate many of the ending speech sounds. In addition, some of their teachers have been influenced by the same culture. Many of the teachers in ghetto schools still encounter some difficulties in hearing and articulating certain of the approximately 40 sounds of Standard English. Therefore, because of this and many other factors, it is not

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[1]The research reported herein is part of our Cooperative Language Development Project supported by Grant #HD-973 from the National Institute of Child Health and Human Development, and by Ford Foundation funds through the Nashville Education Improvement Project. This experiment was carried out in collaboration with the Nashville Metropolitan Schools. Acknowledgements are extended to the many teachers and administrators who participated in the study. Special recognition is given to M.D. Neely, Coordinator of Special Projects in the Nashville-Metro School System, who was the main force in the school district behind the conception and execution of this experiment.

surprising that Southern disadvantaged children demonstrate progressive academic retardation in school. To give these pupils an adequate start, it would appear that improved and more appropriate procedures are needed especially to teach these youngsters oral and written language.

In response to this need, a study was undertaken through the Cooperative Language Development Project (CLDP) to contrast the relative effectiveness of two new approaches for teaching language development to disadvantaged children. The study included a treatment period of the first three grades of school, as well as a one-year follow-up evaluation. The oral language program consisted of experimental versions of the Peabody Language Development Kits (Dunn & Smith, 1965, 1966, 1967). Level #1, Level #2, and Level #3 were used during the first, second, and third years, respectively (i.e., 1964-65, 1965-66, 1966-67). The experimental reading program was the Early-to-Read Initial Teaching Alphabet (ITA) program (Mazurkiewicz & Tanyzer, 1963). To make the transition into traditional orthography (TO), the children were provided with the Basic Reading series by McCracken and Walcutt (1963). In contrast to the experimental groups, the control group used the Houghton Mifflin basal reading program (McKee, Harrison, McCowen, & Lehr, 1963) in traditional orthography and received no oral language stimulation.

A secondary purpose of this study involved an evaluation of the effectiveness of the PLDK lessons taught to the total classroom and to smaller groups by different types of instructional personnel (Dunn & Mueller, 1966; Dunn, Pochanart, & Pfost, 1967; Dunn, Pochanart, Pfost, & Bruininks, 1968). The PLDK lessons were taught by: 1) regular teachers,

2) team teachers, 3) itinerant teachers, and 4) community volunteer assistants. Furthermore, each type of instructional personnel taught the PLDK lessons both to the entire classroom, and to smaller groups of children consisting of one-half the class at a time. An enumeration of all treatment groups for each of the three years of the experiment proper appears below.

Research Design

During the school year of 1964-65, 10 experimental groups and a control group were established. The 10 experimental groups were:

1. Reading in ITA, without PLDK.
2. Reading in ITA, plus PLDK taught by the teacher to the total class.
3. Reading in TO, plus PLDK taught by the teacher to the total class.
4. Reading in TO, plus PLDK taught by the teacher to the class in two groups (first the fast and then the slow half of the class).
5. Reading in TO, plus PLDK taught by a team teaching approach (regular teacher and visiting teacher) to the total class.
6. Reading in TO, plus PLDK taught by a team teaching approach to the class in two groups.
7. Reading in TO, plus PLDK taught by an itinerant teacher to the total class.
8. Reading in TO, plus PLDK taught by an itinerant teacher to the class in two groups.
9. Reading in TO, plus PLDK taught by the regular teacher and a community volunteer to the total class.
10. Reading in TO, plus PLDK taught by the regular teacher and a community volunteer to the class in two groups.

In the second year (1965-66), one-half of the classes which received PLDK, Level #1, during their first year in school received a second year of oral language stimulation using the experimental edition of PLDK, Level #2. This division created the following additional groups:

11. Reading in ITA, plus two years of PLDK taught by the teacher to the total class.

12. Reading in TO, plus two years of PLDK taught by the teacher to the total class.

13. Reading in TO, plus two years of PLDK taught by the teacher to the class in two groups.

14. Reading in TO, plus two years of PLDK taught by a team teaching approach to the total class.

15. Reading in TO, plus two years of PLDK taught by a team teaching approach to the class in two groups.

16. Reading in TO, plus two years of PLDK taught by the regular teacher and a community volunteer to the total class.

17. Reading in TO, plus two years of PLDK taught by the regular teacher and a community volunteer to the class in two groups.

During the final year (1966-67), one-half of the classes in groups 11, 12, 14, and 16 received Level #3 of the PLDK. This division created the following groups:

18. Reading in ITA, plus three years of PLDK taught by the teacher to the total class.

19. Reading in TO, plus three years of PLDK taught by the teacher to the total class.

20. Reading in TO, plus three years of PLDK taught by a team teaching approach (regular teacher and a visiting teacher).

Complete discussions of the results of previous analyses appear in earlier monographs. Dunn and Mueller (1966) reported progress after the first school year, 1964-65, when the children had completed grade one. Dunn, Pochanart, and Pfost (1967) reported the results following the

school year, 1965-66, when the children had completed their second grade. Dunn, Pochanart, Pfost, and Bruininks (1968) reported on the children after they had completed the school year of 1966-67, or the third grade, and are the results of the study at the conclusion of its three-year experimental period.

The present paper reports on a follow-up study after the children had completed their fourth year in school. The follow-up was conducted to determine if gains at the termination of the experimental period would be maintained. Clearly the efficacy of educational interventions is reduced sharply unless gains are retained over a longer term than simply the completion of an experiment.

This report is briefer than each of the first three monographs. The reader is referred to these longer versions for details on the experimental design, measurement instruments, intervention treatments, review of the literature, and results. The following report is restricted to a discussion of the results of educational interventions involving ITA and/or PLDK taught by the regular teacher. Earlier findings had consistently demonstrated that the variables--"type of instructor," and "size of group"--had no effects on pupil progress. Thus, there seemed to be no need to evaluate the subjects on these dimensions in the follow-up study.

The results after the three-year experimental periods were quite positive. On the Metropolitan Achievement Test, children using ITA were significantly advanced in written language achievement over those taught to read through the conventional basal reading program in traditional orthography (TO). Furthermore, the PLDK lessons enhanced school

achievement significantly, especially for the ITA children. On the Illinois Test of Psycholinguistic Abilities, the language age gains of the PLDK subjects were significantly greater than those obtained by the non-PLDK group, with a tendency for the combined ITA and PLDK treatments to be particularly facilitating. No significant differences in hearing vocabulary were found among the PLDK groups as measured by the Peabody Picture Vocabulary Test. This finding suggests that the PLDK lessons had little effect on this aspect of language. Finally, the PLDK lessons enhanced IQ gain scores on the 1960 Stanford Binet, particularly for children in both ITA plus PLDK.

Purpose

The purpose of the follow-up study was to determine if the differences obtained after the third grade would still remain when the children had completed their fourth year in school.

Treatments

Brief descriptions of the two curricular adaptations used in the project appear below.

Initial Teaching Alphabet

The Early-to-Read series developed by Mazurkiewicz and Tanyzer (1963) was used as the experimental reading program. In contrast to the Downing Reading series, which utilizes a sight vocabulary approach, the Mazurkiewicz and Tanyzer program is based on the premise that children should first learn the individual sound symbols before being taught to synthesize them into words. Thus, the program emphasizes a phonic rather than a sight vocabulary approach. This focus appeared to hold special

promise for Southern youth who frequently experience difficulty enunciating many of the standard speech sounds.

The experimental children moved from the Early-to-Read series into the Basic Reading series by McCracken and Walcutt (1963). They began in Book 2-1 which gives a systematic review of the phonetic elements of beginning reading in TO. The experimental children continued in this same series in the third year. In the fourth year, they were placed in the standard Reading-for-Meaning series used in the local school system. The controls received this conventional beginning reading program used in the Nashville-Metro School District, namely the Reading-for-Meaning series, published by Houghton Mifflin.

Peabody Language Development Kits

The experimental editions of Levels #1, #2, and #3 of the PLDK, developed by Dunn and Smith (1965, 1966, 1967), were used in the study. Level #1 was designed for first grade, Level #2 for second grade, and Level #3 for third grade disadvantaged children. The lessons were constructed to stimulate oral language and verbal intelligence, as well as to enhance school progress. Each of the levels of the kits consisted of 180 daily lessons--one for each day of a school year. The lessons provided 30 to 35 minutes of well-planned daily oral language stimulation exercises. The philosophy of the program was that language time should be a half-hour interlude from conventional school work. Though early lessons required considerable teacher participation, the overall goal was to maximize the oral language behavior of the pupils in order to give them opportunities to talk, think, and learn effectively.

Method

Research Design

Only 8 of the 21 groups described earlier were utilized for purposes of this follow-up. The research design if illustrated in Figure 1. Group 1 received ITA but no PLDK; Group 2 received ITA plus one year of PLDK; Group 3 received the conventional reading approach (TO) plus one year of PLDK; Group 4 received ITA plus two years of PLDK; Group 5 received conventional reading plus two years of PLDK; Group 6 received ITA plus three years of PLDK; Group 7 received conventional reading plus three years of PLDK. The eighth group consisted of control subjects taught in a conventional TO reading approach without the PLDK lessons.

Oral Language Development

Initial Reading	Without PLDK (W/0)	One Year PLDK (W/1)	Two Year PLDK (W/2)	Three Year PLDK (W/3)	Totals
ITA	Group 1 Boys = 18 Girls = 18 Total = 36	Group 2 Boys = 14 Girls = 14 Total = 28	Group 4 Boys = 5 Girls = 2 Total = 7	Group 6 Boys = 7 Girls = 10 Total = 17	88
TO	Group 8 Boys = 18 Girls = 18 Total = 36	Group 3 Boys = 14 Girls = 14 Total = 28	Group 5 Goys = 7 Girls = 7 Total = 14	Group 7 Boys = 10 Girls = 10 Total = 20	98
Totals	72	56	21	37	186

Fig. 1. Pictorial description of treatment groups and number of subjects included in the follow-up analysis.

During the first year (1964-65), there were four classes in each of the three experimental treatments: ITA only, ITA plus PLDK, and conventional reading plus PLDK. The classes were grouped so as to assign at least two teachers to a similar treatment in a school. For the second year (1965-66), some of the classes in ITA plus PLDK continued PLDK for the second year (creating Group 4), and some of the classes in TO plus PLDK continued the second year of PLDK (creating Group 5). In the third year (1966-67), one of the classes in ITA, which had received two years of PLDK, continued PLDK for a third year (creating Group 6), and one of the classes in TO which had received two years of PLDK continued PLDK for a third year (creating Group 7).

Subjects

A total of approximately 1,000 experimental and 150 control subjects were selected initially to participate in the program. During the first year, complete pre- and end-of-the-year test data were collected on 732 subjects. Administrative considerations dictated that the various experimental treatments be carried out among all children enrolled in intact classrooms. Consequently, the groups were neither comparable in size nor on such variables as intelligence quotients, mental ages, chronological ages, language ages, and family background. To control for these differences, a selected study sample was established by deleting subjects who did not meet criteria set up for disadvantaged children. Specifically, children with IQ scores above 110, as well as those from adequate housing and socioeconomic status were excluded. At the end of the second year of the treatment, complete test data were obtained on 384 subjects. At the end of the third year,

end-of-year test data were obtained on 401 subjects, with complete test data available for all four testings on only 341 of these 401 subjects.

Additional subject attrition had taken place by the time of the follow-up study in the Spring of 1968. The number of subjects on whom complete follow-up data were obtained was 216. Thirty subjects were deleted because they possessed: 1) high IQs, 2) high CAs, or 3) lacked complete 1964 and 1967 test data. The final sample of 186 subjects was distributed across the treatment groups as illustrated in Figure 1. (An additional 10 "statistical" subjects were added to make the sample sizes of the treatment groups proportional for the analyses of variance and covariance.[2])

Teachers

Involved in the seven ITA and PLDK experimental treatments were 12 teachers in a total of six schools--four serving essentially all Negro youth, and two well-integrated with Negro and Caucasian children. Eight of the teachers were Negro and four were Caucasian. In addition, seven teachers taught control classess, five of which served solely Negro children while the other two were integrated. All of the experimental and control teachers were fully certified in elementary education, held one or more degrees, and had more than one year of experience in teaching primary-grade children. The experimental teachers were asked to stay with the

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[2]Two statistical male and five statistical female subjects were added to Group 4, and three statistical female subjects to Group 6. The means of respective groups were used to make the substitution for missing data. The degrees of freedom were adjusted accordingly.

same group of children for the first two years. In fact, some of the pairs of teachers in the schools regrouped their children in the second year, with one teacher taking the slower half and the other the more able half of the class. New third grade teachers taught the children during the final experimental year; another set of teachers taught the children during the fourth grade follow-up year.

The experimental teachers were given a number of incentives not available to the control teachers. They were provided with small supplementary stipends and were asked to attend in-service training sessions throughout the year--approximating one every two or three weeks. Supplementary materials were purchased for the experimental teachers. They were visited frequently by the researchers, supervisors, and school officials. Furthermore, they were given considerable recognition by their principals and had an opportunity to observe each other teach. The experimental teachers knew they were being monitored, and motivation to excellence in teaching was high. In contrast, the control teachers were not given comparable stimulation or support. Their children were simply tested at the beginning of the experiment and retested at the end of each subsequent school year. Consequently, a very important part of the experiment treatment was the added incentives provided the experimental teachers for the first three years, but not to the control teachers. (During the fourth year, no additional incentives were available to the teachers of either the experimental or control subjects.)

Another bias may have been introduced by school and teacher selection. The central office staff of the school district helped select schools and teachers to participate in the project. There may have

been a tendency to choose schools in better neighborhoods (and better teachers) to participate in the experimental treatments. The number of schools represented by each treatment was small, and one school that served a somewhat higher socioeconomic level of children was assigned to the ITA plus three-year PLDK combination. Although strictly random assignment was used to determine which schools would continue in the PLDK treatments subsequent to the first year, selection bias may have still operated.

Evaluation

Six measures[3] were obtained to study pupil progress. They are described briefly below.

General Intellectual Functioning. The 1960 Stanford-Binet Intelligence Scale (Terman & Merrill, 1960) was used to secure data on general intellectual functioning. The Stanford-Binet (S-B) is a standardized, individually administered intelligence scale yielding mental age and intelligence quotient scores. The test items range from the simple manipulation of objects to abstract reasoning. They are grouped into age levels in an ascending order of difficulty and range from age two to superior adult.

Hearing Vocabulary. The Peabody Picture Vocabulary Test (Dunn, 1965) was used as one measure of oral language. This test (PPVT) is an individually administered, single channel instrument yielding a measure of hearing vocabulary. The subject is required to indicate which of four

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[3]The Illinois Test of Psycholinguistic Abilities (ITPA) was dropped from the follow-up evaluation because it measures only over the two and one-half to nine year range, and therefore lacked sufficient difficulty for fourth grade children.

response pictures correctly depicts the meaning of a stimulus word presented orally by the examiner.

Creative Thinking[4]. The Research Edition of Torrance Tests of Creative Thinking (Torrance, 1966) were used as a measure of creativity. This test battery has both verbal and figural tasks. Only the first four verbal subtests of Form A were administered in the CLDP evaluation. These four tests included the following activities:

(a) The Ask and Guess Activity (Test #1)--asking questions about a drawing. The questions are answerable by merely looking at the picture.

(b) The Guess Causes Activity (Test #2)--making guesses about the causes of the event pictured.

(c) The Guess Consequences Activity (Test #3)--making guesses about the possible consequences of the event.

(d) The Product Improvement Activity (Test #4)--producing ideas for improving a toy so that it will be more fun for children to play with.

Although norms exist on the Torrance Tests, raw scores were used in all statistical analyses. Three scores were obtained for the verbal subtests (fluency, flexibility, and originality). The three scores are defined as:

(a) Verbal Fluency--ability to produce a large number of ideas with words.

(b) Verbal Flexibility--ability to produce different types of ideas or strategies.

(c) Originality-ability to produce ideas that are distinct from the obvious and commonplace. (Torrance maintains that subjects who achieve a high score on Verbal Originality usually have a great deal of intellectual energy and may be rather nonconforming.)

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[4]Figural subtests were administered at posttesting. These were dropped in the follow-up to save time.

These three scores were summed to provide the Verbal Subtest Score used in the follow-up analyses.

The Torrance Tests were included in the evaluation because research has shown that they appear to be sensitive to the differential kinds of growth or change resulting from different teaching procedure, environmental conditions, etc. Moreover, they appear to be especially sensitive to one of the kinds of skills the Peabody Language Development Kits attempt to develop--namely divergent thinking.

School Achievement. The Metropolitan Achievement Test (MAT) was used to measure academic achievement. At the end of the third year, the written language portions of the Elementary Battery were administered (Durost, Bixler, Hildreth, Lund, & Wrightstone, 1959). The MAT consists of the: Word Knowledge (WK), Word Discrimination (WD), Reading Comprehension (R), Spelling (S), and Language (L) Subtests. The achievement testing took place from late March to mid-May. Actual grade placement at time of testing averaged about 3.75 (mid-April). All achievement testing was conducted by project personnel and not be the classroom teachers.

Written Language Development. The written Picture Story Language Test (Myklebust, 1965) was used to assess written language abilities. The children were asked to write a story about a picture. The writing samples were evaluated for: 1) productivity, 2) correctness, and 3) meaning level or abstraction. Productivity was measured by computing number of words, number of sentences, and the number of words per sentence. Grammatical correctness (or syntax) was evaluated by assessing accuracy in the use of word usage, word endings, and punctuation.

Meaning (or level of abstraction) was measured by means of an Abstract-Concrete Scale with score values ranging from 0 to 25. (Only raw scores from the test are reported in this paper.)

Oral Language Development. An Oral Picture Story Language Test was designed by the project staff to parallel the Myklebust's Written Picture Story Language Test, and modeled somewhat after our earlier Peabody Language Production Inventory (Nelson, 1964). A street scene involving a dog catcher, dog, and children was devised. Each child was asked to tell a story about the picture. The taped stories were transcribed and scored to yield a raw score measure of 1) productivity, and 2) meaning level or abstraction. As in the Myklebust test, productivity was measured by computing the number of words, number of sentences, and number of words per sentence. Meaning was assessed by means of an Abstract Concrete Scale with score values ranging from 0 to 22 (it was not necessary to go as high as 25 to score our subjects). This test is a non-standardized measure for which only raw scores were available.

Test Schedule

The follow-up testing was conducted in the Spring, 1968, beginning in mid-March and completed in early June. All testing was conducted by project personnel who were, in large measure, psychometric technicians working under the direction of psychological examiners.

Statistical Analyses

Analyses of variance and covariance were used to compare treatments among the groups. Lindquist Type III analyses of variance (Lindquist, 1953) were used to evaluate differences between treatment groups on scores of the Stanford-Binet and Peabody Picture Vocabulary Test. The

design for the Lindquist Type III analysis of variance is illustrated in Figure 2. Statistical analyses on the various treatment groups in all areas of evaluation were conducted by means of 4 x 2 analyses of variance or covariance (PLDK groups x reading methods). The 4 x 2 analyses of variance or covariance were conducted separately for posttest and follow-up measures for all test scores. This design is illustrated in Figure 3.

Analysis of covariance was used on most measures to adjust statistically for the differences between the treatment groups on pretest IQ. In a few analyses, analysis of covariance was not employed due to finding a relatively low within cells correlation between pretest IQs and the criterion test performance (in some instances the within cells correlation between the two variables was negative). Analysis of variance was used in a few measures where the within cells correlations in lieu of analysis of covariance were low and/or negative (Feldt, 1958).

Since the CLDP was an exploratory educational intervention study, the .90 level of confidence was used in all analyses. When t tests were used to analyze significant main effects or interactions, the .95 level of confidence was employed. One-tailed tests of significance were used on all between group comparisons, while two-tailed tests were used for the within subject analyses.

Results and Discussion

Characteristics of the Subjects

The pretest characteristics of the selected sample of 186 subjects used in the fourth-grade, follow-up analysis are outlined in Table 1. These data describe the children when they entered the first grade--and

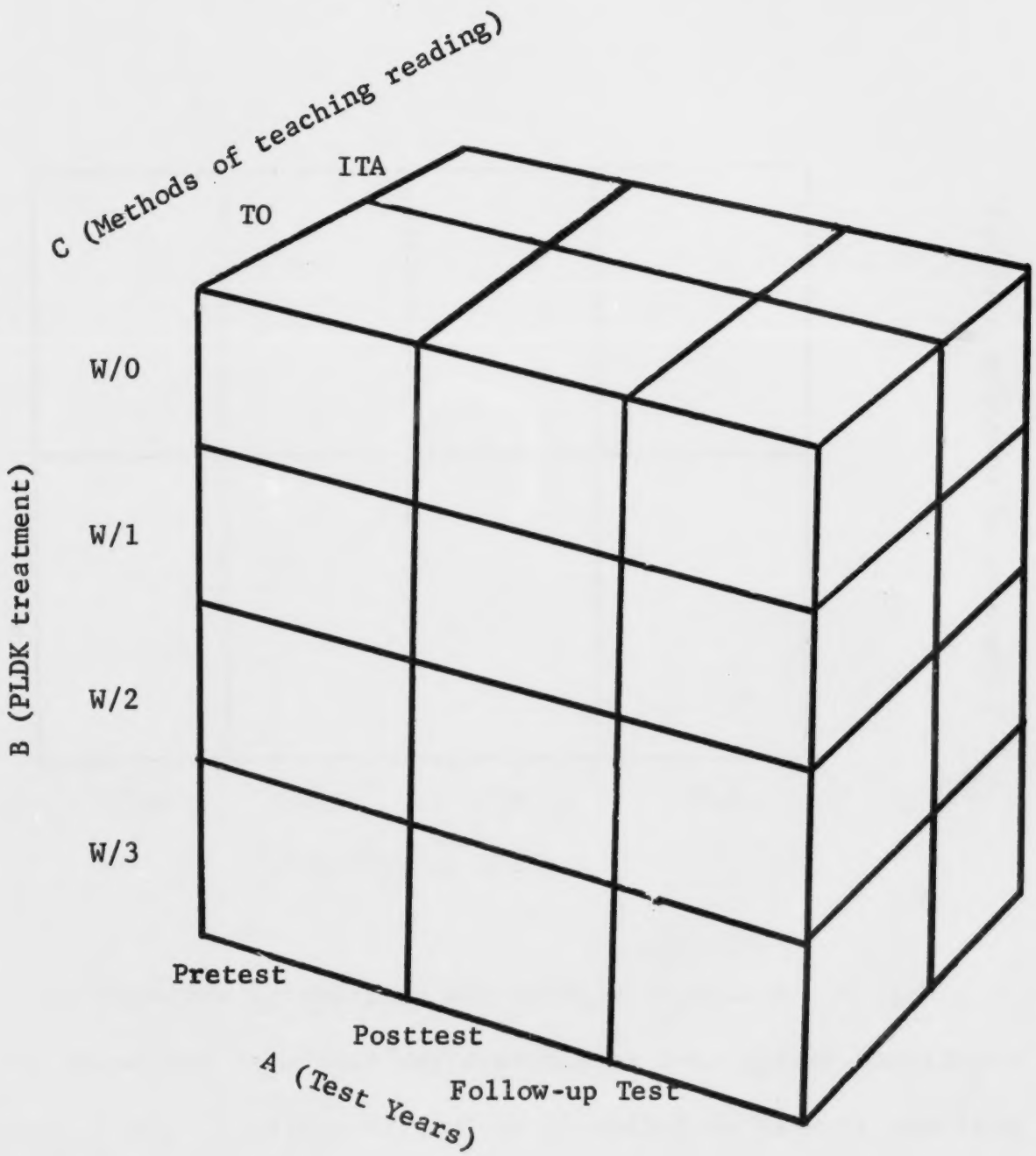

Fig. 2. Pictorial view of the Lindquist Type III analysis of variance design used in the follow-up analyses of the Stanford-Binet and Peabody Picture Vocabulary Test.

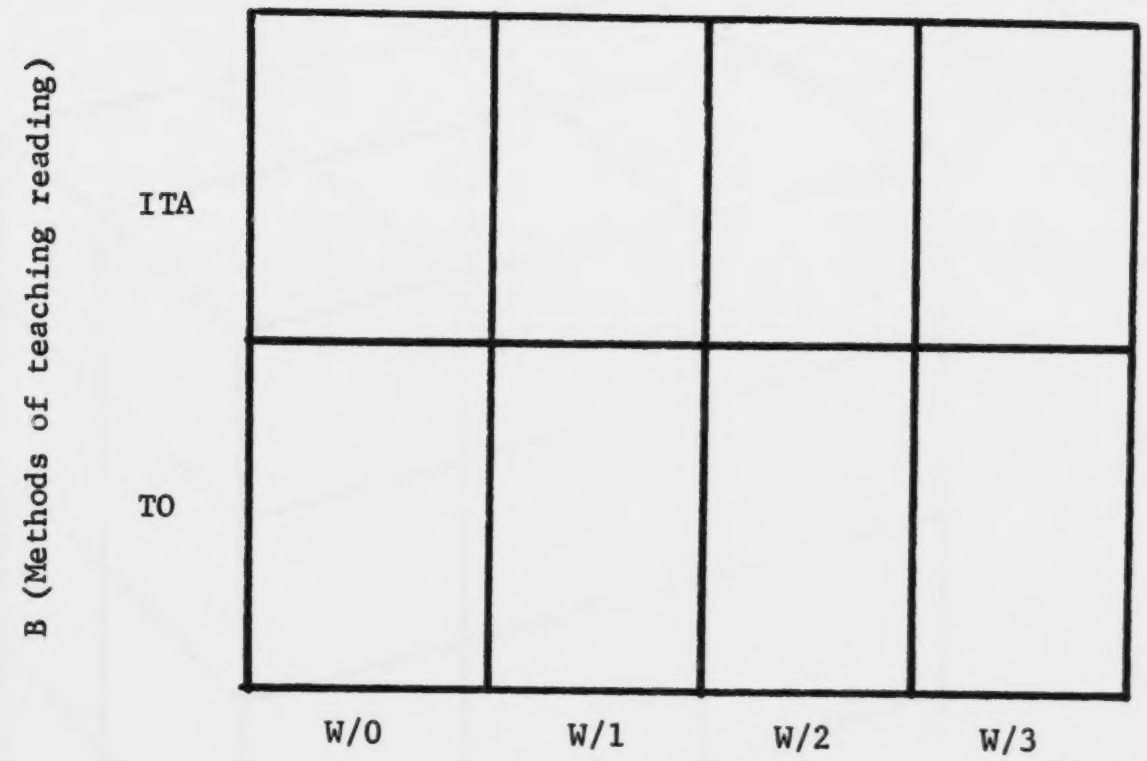

Fig. 3. Pictorial view of the analysis of variance and covariance design used to contrast the treatment groups on posttest as well as follow-up evaluation scores.

Table 1

Summary of Pretest Data on the Selected Samples Used in the Posttest and Follow-up Analyses

Treatment Group	N	CA		SB-IQ		PPVT-IQ	
		X	S	X	S	X	S
Without PLDK							
With ITA	36	74.61	4.14	86.64	13.51	74.58	22.79
With TO	36	73.78	5.04	85.11	10.58	79.61	15.25
Total	72	74.19	4.60	85.88	12.07	77.10	19.42
One Year PLDK							
With ITA	28	75.04	4.93	79.39	10.16	65.68	21.95
With TO	28	77.64	4.96	82.82	12.48	77.14	18.69
Total	56	76.34	5.08	81.11	11.41	71.41	21.01
Two Years PLDK							
With ITA	7	74.71	3.86	88.29	7.61	77.71	11.15
With TO	14	77.93	8.23	82.64	12.69	72.64	23.84
Total	21	76.86	7.14	84.52	11.38	74.33	20.32
Three Years PLDK							
With ITA	17	73.59	3.47	95.94	7.93	91.76	17.28
With TO	20	76.55	5.54	90.50	13.47	83.15	20.79
Total	37	75.19	4.88	93.00	11.46	87.11	19.49
Totals							
With ITA	88	74.56	4.23	86.26	12.45	75.32	22.48
With TO	98	76.04	5.86	85.20	12.22	78.63	18.77
Grand Total	186	75.34	5.19	85.70	12.30	77.06	20.62

the Cooperative Language Development Project--in the Fall, 1964. They averaged six years, three months in age, 85.70 in mean SB-IQ score, and a mean of 77.06 on PPVT-IQ scores. Clearly, differences existed across treatment groups. Tests to determine if the pretest differences among groups were statistically significant are reported in Table 2. On all three characteristics--CA, SB-IQ, and PPVT-IQ--the differences among groups were significant. An examination of Table 1 reveals that the three-year PLDK treatment group was 7.3 IQ points above the average IQ for the grand total of subjects. (Socioeconomic data also indicated the subjects in this group came from slightly better home backgrounds.)

General Intellectual Functioning

The pretest, posttest, follow-up, and gain scores on the Stanford-Binet Intelligence Scale are reported in Table 3. In terms of grand totals, the average IQ of the 186 subjects upon entering school was 85.7. By the end of the third grade, their average IQ score had risen 4.68 points to 90.38. The subjects had dropped back 1.06 points to 88.78 by the end of the fourth grade. The three-year PLDK group had gained the most (9.89 points) but displayed a decrement in scores from the posttest to follow-up evaluations (3.43 IQ points).

Table 4 contains the analysis of variance statistics on pretest, posttest, and follow-up test IQ scores (test years x PLDK levels x ITA vs. TO). Inspection of Table 4 indicates the presence of a significant test years by PLDK levels by ITA vs. TO interaction. Further analyses among the eight treatment groups demonstrated that for the children who were taught to read in ITA, those receiving one, two, and

Table 2

Analysis of Variance on Pretest Data

Variable	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.95}$
CA	Between	7	436.082	62.297	2.435*	2.01
	Within	178	4553.618	25.582		
	Total	185	4989.700			
SB-IQ	Between	7	3811.546	544.507	4.006**	2.01
	Within	178	24197.254	135.940		
	Total	185	28008.800			
PPVT-IQ	Between	7	8776,176	1253.739	3.193**	2.01
	Within	178	69895.124	392.669		
	Total	185	78671,300			

*p <.05
**p <.01

Table 3

Means and Standard Deviations for the Stanford-Binet Intelligence Scale
Pre-, Post-, Follow-up, and Gain-Scores

Treatment Group	N		Pre	Post	Follow-up	Gain[a]	Gain[b]	Gain[c]
Without PLDK								
With ITA	36	$\bar{X}$	86.64	87.06	85.08	0.42	-1.56	-1.98
		S	13.51	14.69	13.90			
With TO	36	$\bar{X}$	85.11	87.97	90.08	2.86	4.97	2.11
		S	10.58	11.52	11.30			
Total	72	$\bar{X}$	85.88	87.51	87.58	1.63	1.70	0.07
		S	12.07	13.11	12.83			
One Year PLDK								
With ITA	28	$\bar{X}$	79.39	84.93	83.04	5.54	3.65	-1.89
		S	10.16	12.18	12.32			
With TO	28	$\bar{X}$	82.82	87.64	85.50	4.82	2.68	-2.14
		S	12.48	12.66	11.05			
Total	56	$\bar{X}$	81.11	86.29	84.27	5.18	3.16	-2.02
		S	11.41	12.39	11.66			
Two Years PLDK								
With ITA	7	$\bar{X}$	88.29	96.71	91.14	8.42	2.85	-5.57
		S	7.61	8.01	5.05			
With TO	14	$\bar{X}$	82.64	85.21	83.64	2.57	1.00	-1.57
		S	12.69	14.47	9.52			
Total	21	$\bar{X}$	84.52	89.05	86.14	4.53	1.62	-2.91
		S	11.38	13.65	8.92			

-continued

Table 3 - continued

Means and Standard Deviations for the Stanford-Binet Intelligence Scale
Pre-, Post-, Follow-up, and Gain-Scores

Treatment Group	N		Pre	Post	Follow-up	Gain[a]	Gain[b]	Gain[c]
Three Years PLDK								
With ITA	17	$\bar{X}$	95.94	108.88	103.71	12.94	7.77	-5.17
		S	7.93	8.80	8.92			
With TO	20	$\bar{X}$	90.50	97.80	95.85	7.30	5.35	-1.95
		S	13.47	12.18	13.08			
Total	37	$\bar{X}$	93.00	102.89	99.46	9.89	6.46	-3.43
		S	11.46	12.00	11.89			
Totals								
With ITA	88	$\bar{X}$	86.26	91.36	88.51	5.10	2.25	-2.85
		S	12.45	15.32	14.19			
With TO	98	$\bar{X}$	85.20	89.49	89.03	4.29	3.83	-0.46
		S	12.22	12.97	11.98			
Grand Total	186	$\bar{X}$	85.70	90.38	88.78	4.68	3.08	-1.06
		S	12.30	14.13	13.04			

[a]Posttest minus pretest IQ.

[b]Follow-up test minus pretest IQ.

[c]Follow-up test minus posttest IQ.

Table 4

Analysis of Variance on the Stanford-Binet Intelligence Scale Pretest, Posttest, and Follow-up Test Scores

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.90}$
Between Subjects	185	83144.0460	449.3155		
B (PLDK)	3	16574.1800	5524.7266	15.7375***	2.08
C (ITA vs. TO)	1	358.3010	358.3010	1.0206	2.71
B x C	3	3723.9930	1241.3310	3.5360**	2.08
Error (b)	178	62487.5720	351.0537		
Within Subjects	372	18474.0000	49.6612		
A (Test Years)	2	2594.0000	1297.0000	32.7009***	2.30
A x B	6	981.3160	163.5526	4.1236***	1.77
A x C	2	174.4080	87.2040	2.1986*	2.30
A x B x C	6	604.4330	100.7388	2.5399**	1.77
Error (w)	356	14119.8430	39.6624		
Total	557	101618.0460			

*p <.10
**p <.05
***p <.01

three years of PLDK made significant IQ gains from the pretest to post-test evaluations. However, only ITA children receiving one and three years of PLDK training made significant IQ gains from pretest to follow-up testing. The t tests between posttest and follow-up test scores yielded a significant decrement for those children who had received two and three years of PLDK. Among the children taught to read in TO, those in the non-PLDK, one-year PLDK, and three-year PLDK groups had made significant IQ gains from pretest to posttest evaluations, as well as from the pre-test to follow-up test evaluations. None of the differences between the posttest and follow-up test evaluations for the four PLDK groups in the TO sample attained statistical significance.

Due to the significant differences on pretest IQ scores (see Table 2), posttest and follow-up IQ scores were statistically adjusted for pretest IQ differences by means of analyses of covariance. (In all subsequent analyses of covariance, posttest and follow-up test scores were adjusted statistically for pretest S-B IQ differences.) The analyses of covariance for posttest and follow-up test scores appear in Tables 5 and 6, respectively. The adjusted means for posttest and follow-up test scores used in analysis of covariance appear in Table 7. Inspection of Table 5 on posttest data reveals the presence of a significant main effect for levels of PLDK, and a significant PLDK by reading method interaction. The t-test analyses indicated that the children who learned to read in ITA attained significantly higher IQ scores, at time of posttesting, than those learning to read in TO within the two- and three-year PLDK treatments only.

Table 5

Analysis of Covariance on IQ Scores of the Stanford-Binet Intelligence Scale--Posttest

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	8090.3434	4828.7617	2638.4502	3	879.4834	10.7481*	2.08
B (ITA vs. TO)	1	95.7602	432.0459	203.4031	182.2251	1	182.2251	2.2269	2.71
A x B	3	577.8857	2061.7647	943.7026	968.8858	3	322.9619	3.9468*	2.08
Error	178	24217.2399	27812.7185	17966.6480	14483.3531	177	81.8268		
Total	185	28341.1582	38396.8725	23942.5154		184			

*p < .01

Table 6

Analysis of Covariance on IQ Scores of the Stanford-Binet Intelligence Scale--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	6014.8796	4434.7903	1604.8545	3	534.9515	6.3492*	2.08
B (ITA vs. TO)	1	95.7602	4.9031	21.6683	15.6798	1	15.6798	0.1861	2.71
A x B	3	577.8857	1688.7755	689.5280	1043.9670	3	347.9890	4.1302*	2.08
Error	178	24217.2399	24577.4572	15298.6002	14912.9716	177	84.2540		
Total	185	28341.1582	32286.0154	20444.5868		184			

*p < .01

Table 7

Adjusted Means for the Stanford-Binet Intelligence Scale

Treatment Group	N	Post	Follow-Up
Without PLDK			
With ITA	36	86.36	84.49
With TO	36	88.41	90.45
Total	72	87.38	87.47
One Year PLDK			
With ITA	28	89.61	87.03
With TO	28	89.78	87.32
Total	56	89.69	87.17
Two Years PLDK			
With ITA	7	94.79	89.50
With TO	14	87.48	85.57
Total	21	89.93	86.89
Three Years PLDK			
With ITA	17	101.28	97.24
With TO	20	94.24	92.82
Total	37	97.47	94.85
Totals			
With ITA	88	90.94	88.16
With TO	98	89.86	89.35
Grand Total	186	90.38	88.78

Among the children who had been taught to read in ITA, the three-year PLDK group obtained significantly higher IQ scores in comparison to those in the non-PLDK group, but not over the one-year PLDK group. The two-year PLDK children also obtained significantly higher scores than those in the non-PLDK groups. Among the children who learned initial reading in TO, the children in the three-year PLDK group obtained significantly higher scores in comparison to those in the other PLDK groups. None of the other differences among PLDK groups reached statistical significance at time of posttesting.

Table 6 contains the analysis of covariance on the follow-up S-B IQ scores. Again the differences among levels of PLDK as well as the PLDK by reading method interaction attained statistical significance. The t-test comparisons between reading groups indicated that the children who learned to read in TO obtained signficantly higher IQ follow-up scores over those learning to read in ITA--only for the group without PLDK experience. No explanation for this result is being offered.

Among children who had learned to read in ITA, the three-year PLDK group obtained significantly higher IQ scores on the follow-up in comparison to the non-PLDK, one-year PLDK, and two-year PLDK groups.

For the TO method group, the children with three years of PLDK training obtained significantly higher IQ scores on the follow-up testing than those receiving one and two years of PLDK. Furthermore, the non-PLDK group was significantly higher in follow-up IQ scores in comparison to the two-year PLDK group. None of the remaining comparisons between the PLDK groups which learned to read in TO were significant.

The following conclusions are drawn from the analyses of IQ test scores:

1. At time of the posttesting and follow-up evaluations, the PLDK treatments significantly enhanced IQ scores, even after the mean IQ scores had been adjusted for initial IQ differences.

2. The children who had learned to read in ITA and had also had two or three years of PLDK lessons were the only groups to lose significantly in IQ scores from posttesting to follow-up testing. These same groups had made significant IQ gains during the experimental treatment period.

3. As anticipated, neither method of teaching initial reading (ITA or TO) had any appreciable effect upon IQ scores. An unanticipated result of the follow-up investigation was that the TO group without PLDK ended the fourth grade with significantly higher IQ scores than the two-year PLDK group. This finding is difficult to interpret.

Hearing Vocabulary

The pretest, posttest, and follow-up, and gain scores on the vocabulary quotient scores from the Peabody Picture Vocabulary Test are reported in Table 8. Overall, the hearing vocabularies of the children were particularly depressed at the outset of the experiment, the mean VQ score for the 186 subjects being 77.06. The subjects gained more in hearing vocabulary than they did in general intellectually functioning, attaining a mean VQ of 86.22 on the average at the end of the third grade and 86.44 at the end of the fourth grade.

Table 9 contains the analysis of variance data on VQ gains from pretest to posttest. Analysis of covariance was not employed because of the

Table 8

Means and Standard Deviations for the Peabody Picture Vocabulary Test

Pre-, Post-, Follow-up, and Gain-Scores

Treatment Group	N		Pre	Post	Follow-up	Gain[a]	Gain[b]	Gain[c]
Without PLDK								
With ITA	36	$\bar{X}$	74.58	84.64	84.53	10.06	9.95	-0.11
		S	22.79	13.29	14.19			
With TO	36	$\bar{X}$	79.61	85.92	86.17	6.31	6.56	0.25
		S	15.25	8.76	11.05			
Total	72	$\bar{X}$	77.10	85.28	85.35	8.18	8.25	0.07
		S	19.42	11.19	12.65			
One Year PLDK								
With ITA	28	$\bar{X}$	65.68	81.64	85.04	15.96	19.36	3.40
		S	21.95	11.48	11.79			
With TO	28	$\bar{X}$	77.14	82.14	81.25	5.00	4.11	-0.89
		S	18.69	11.24	12.55			
Total	56	$\bar{X}$	71.41	81.89	83.14	10.48	11.73	1.25
		S	21.01	11.26	12.22			
Two Years PLDK								
With ITA	7	$\bar{X}$	77.71	83.43	89.00	5.72	11.29	5.57
		S	11.15	3.51	6.93			
With TO	14	$\bar{X}$	72.64	80.29	79.50	7.65	6.86	-0.79
		S	23.84	7.04	13.89			
Total	21	$\bar{X}$	74.33	81.33	82.67	7.00	8.34	1.34
		S	20.32	6.18	12.68			

-continued

Table 8 - continued

Means and Standard Deviations for the Peabody Picture Vocabulary Test

Pre-, Post-, Follow-up, and Gain Scores

Treatment Group	N		Pre	Post	Follow-up	Gain[a]	Gain[b]	Gain[c]
Three Years PLDK								
With ITA	17	$\bar{X}$	91.76	101.76	101.06	10.00	9.30	-0.70
		S	17.28	11.70	11.52			
With TO	20	$\bar{X}$	83.15	93.60	91.10	10.45	7.95	-2.50
		S	20.79	12.70	16.68			
Total	37	$\bar{X}$	87.11	97.35	95.68	10.24	8.57	-1.67
		S	19.49	12.76	15.20			
Totals								
With ITA	88	$\bar{X}$	75.32	86.90	88.24	11.58	12.92	1.34
		S	22.48	13.90	13.89			
With TO	98	$\bar{X}$	78.63	85.60	84.82	6.97	6.19	-0.78
		S	18.77	11.04	13.60			
Grand Total	186	$\bar{X}$	77.06	86.22	86.44	9.16	9.38	0.22
		S	20.62	12.45	13.81			

[a]Posttest minus pretest IQ.

[b]Follow-up test minus pretest IQ.

[c]Follow-up test minus posttest IQ.

relatively low correlation between pretest and posttest, and pretest follow-up VQ scores on the PPVT. No significant main effects or interactions were found. Apparently, amount of PLDK instruction, type of initial reading instruction, and the combination failed to result in any appreciable increases in PPVT scores from pre- to posttest.

Table 9

Analysis of Variance on VQ Gains on the Peabody Picture Vocabulary Test Pretest vs. Posttest

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	554.5278	184.8426	0.6360	2.08
B (ITA vs. TO)	1	576.0000	576.0000	1.9819	2.71
A x B	3	1558.4893	519.4964	1.7875	2.08
Error	178	51731.3707	290.6256		
Total	185	54420.3878			

The analysis of variance on VQ gains from pretest to follow-up test evaluations appears in Table 10. The results of the analysis of variance yielded significant main effects on reading method, as well as a PLDK by methods of teaching interaction. Analysis of the PLDK by methods of teaching interaction revealed that children learning to read in ITA made significantly greater VQ gains only in combination with the one year of PLDK. Within the other PLDK groups, none of the comparisons between the ITA and TO approaches to teaching reading reached statistical

Table 10

Analysis of Variance on VQ Gains on the Peabody Picture Vocabulary Test

Pretest vs. Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	714.2428	238.0809	0.8689	2.08
B (ITA vs. TO)	1	1438.5765	1438.5765	5.2503**	2.71
A x B	3	2034.3671	678.1223	2.4749*	2.08
Error	178	48771.5636	273.9975		
Total	185	52958.7500			

*p <.10
**p <.05

significance. Among children who had been taught to read in ITA, the one-year PLDK group obtained significantly higher VQ gains in comparison to the group without PLDK. None of the other comparisons between the PLDK groups reached statistical significance.

The following conclusions are drawn from the PPVT analyses:

1. At time of posttesting, neither PLDK treatments nor the reading approaches had a significant influence upon PPVT VQ scores.

2. One year later, children who learned to read in ITA had made significantly greater VQ gains, only when combined with one year of PLDK. The gain made by the ITA group with one year of PLDK was probably spurious.

Creative Thinking

The unadjusted pretest, posttest, follow-up, and gain scores on the Verbal Subtests of the Torrance Tests of Creative Thinking are reported in Table 11. The adjusted means on the post- and follow-up test data are reported in Table 12. Examination of the unadjusted mean values in Table 11 reveals that the children with three years of PLDK obtained posttest scores on the Torrance Test of a much higher order than those of the other groups (W/3 = 113.70; W/2 = 85.43; W/1 = 77.45; W/0 = 75.33). During their fourth grade, the scores of the children with three years of PLDK decreased dramatically on the Verbal Subtests of the Torrance Test (W/3 - 15.05) while the other three groups demonstrate gains in performance (W/2 + 2.76; W/1 + 11.32; W/0 + 7.78).

The analysis of covariance on the posttest Verbal Subtest scores of the Torrance Tests appears in Table 13. Significant main effects were obtained on levels of PLDK and on methods of teaching, as well as the methods of teaching by PLDK interaction. Further analyses of the significant interaction revealed that the TO children were significantly superior in comparison to those learning to read in ITA only within the group which did not receive the PLDK lessons. Within both the ITA and TO reading groups, children receiving three years of PLDK training obtained significantly higher scores when compared to those with no PLDK, one year of PLDK, or two years of PLDK training. Moreover, the one-year PLDK children within the ITA groups also obtained significantly higher creativity scores in comparison to those who did not receive the PLDK training.

Table 11

Unadjusted Means and Standard Deviations on Total Verbal Subtest Scores of the Torrance Tests of Creativity Post-, Follow-up, and Difference Scores

Treatment Group	N		Post	Follow-up	Diff.
Without PLDK					
With ITA	36	$\bar{X}$	65.08	80.17	15.09
		S	27.18	32.06	
With TO	36	$\bar{X}$	85.58	86.06	0.48
		S	31.19	37.21	
Total	72	$\bar{X}$	75.33	83.11	7.78
		S	30.83	34.61	
One Year PLDK					
With ITA	28	$\bar{X}$	80.11	91.96	11.85
		S	29.73	31.80	
With TO	28	$\bar{X}$	74.79	85.57	10.78
		S	26.16	25.59	
Total	56	$\bar{X}$	77.45	88.77	11.32
		S	27.87	28.78	
Two Years PLDK					
With ITA	7	$\bar{X}$	76.86	94.71	17.85
		S	26.37	26.19	
With TO	14	$\bar{X}$	89.71	84.93	-4.78
		S	39.37	34.08	
Total	21	$\bar{X}$	85.43	88.19	2.76
		S	35.42	31.35	
Three Years PLDK					
With ITA	17	$\bar{X}$	104.41	86.12	-18.29
		S	33.36	20.19	
With TO	20	$\bar{X}$	121.60	109.30	-12.30
		S	31.43	31.22	
Total	37	$\bar{X}$	113.70	98.65	-15.05
		S	33.04	28.86	
Totals					
With ITA	88	$\bar{X}$	78.40	86.23	7.83
		S	32.11	29.68	
With TO	98	$\bar{X}$	90.44	90.50	0.06
		S	34.96	33.47	
Grand Total	186	$\bar{X}$	84.74	88.48	3.74
		S	34.09	31.72	

Table 12

Adjusted Means on Total Verbal Subtest Scores

of the Torrance Tests of Creativity

Post- and Follow-up Scores

Treatment Group	N	Post	Follow-up
Without PLDK			
With ITA	36	64.87	79.75
With TO	36	85.71	86.32
Total	72	75,29	83.03
One Year PLDK			
With ITA	28	81.54	94.77
With TO	28	75.44	86.85
Total	56	78.49	90.82
Two Years PLDK			
With ITA	7	76.27	93.56
With TO	14	90.40	86.29
Total	21	85.70	88.72
Three Years PLDK			
With ITA	17	102.09	81.55
With TO	20	120.51	107.16
Total	37	112.05	95.40
Total			
With ITA	88	78,27	85.98
With TO	98	90.55	90.72
Grand Total	186	84.74	88.48

Table 13

Analysis of Covariance on the Total Verbal Subtest Scores of the Torrance Tests of Creativity--Post

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	41905.7367	10337.2759	34094.5800	3	11364.8600	12.3964**	2.08
B (ITA vs. TO)	1	95.7602	5775.9999	-743.7143	6094.1755	1	6094.1755	6.6473**	2.71
A x B	3	577.8857	5677.3143	-1332.8180	6225.1773	3	2075.0591	2.2634*	2.08
Error	178	24217.2399	163516.9287	5492.4503	162271.2455	177	916.7866		
Total	185	28341.1582	216875.9796	13753.1939		184			

*p <.10
**p <.01

The analysis of covariance on the follow-up verbal subtest scores of the Torrance Tests appears in Table 14. No significant differences were obtained among PLDK levels or methods of teaching reading. However, a significant PLDK by method of teaching interaction was obtained. Analysis of this interaction revealed that the children learning to read in TO were significantly superior in creativity to those learning to read in ITA only within the three-year PLDK group. The most remarkable finding was the sharp drop in mean Verbal Subtest scores of 15.05 points by the three-year PLDK group (see Table 11). Apparently, the brainstorming exercises in the Level #3 PLDK lessons, which this one group of children continued to receive up to the posttesting, stimulated and inflated the test scores of their group to a mean of 113.7 in contrast to a mean of 84.74 for the total group. This inflation was largely lost during the follow-up year. Within the ITA reading group, only one significant difference was obtained between the various PLDK levels--i.e., the one-year PLDK children obtained significantly higher scores when compared to those who did not receive PLDK. Among children learning to read in TO, the three-year PLDK group obtained significantly higher scores in comparison to the non-PLDK, one-year PLDK, and two-year PLDK groups. No significant differences appeared on the remaining comparisons among PLDK groups who had been taught to read in TO.

The following conclusions are drawn for the analyses of Verbal Subtest scores on the Torrance Tests of Creativity:

1. Upon posttesting, the PLDK lessons stimulated creativity scores, especially for subjects with three years of PLDK.

Table 14

Analysis of Covariance on the Total Verbal Subtest Scores of the Torrance Tests of Creativity--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	6076.9648	2690.4010	4315.5385	3	1438.5128	1.5007	2.08
B (ITA vs. TO)	1	95.7602	414.4133	-199.2092	608.7423	1	608.7423	0.6350	2.71
A x B	3	577.8857	7099.0125	-1006.8711	8047.5600	3	2682.5200	2.7985*	2.08
Error	178	24217.2399	174476.1962	10800.5518	169659.3005	177	958.5271		
Total	185	28341.1582	188066.5868	12284.8725		184			

*p < .05

2. In the follow-up, the effects of the PLDK in stimulating creativity scores had been generally lost. The group with three years of PLDK scored higher than the other PLDK groups only in combination with the TO approach to teaching reading.

School Achievement

Post and follow-up scores from the written language subtests of the Metropolitan Achievement Tests are presented in Table 15, 16, and 17. The scores were derived from the five written language subtests: 1) Word Knowledge, 2) Word Discrimination, 3) Reading (Comprehension), 4) Spelling, and 5) Language. The total score was obtained by averaging the five subtests. Reported in Table 15 are the unadjusted grade equivalent scores. Table 16 contains the unadjusted raw scores, and in Table 17 the adjusted mean raw scores upon which the analyses of variance were based. Examination of Table 15 reveals that the 186 subjects achieved a mean grade equivalent of 3.71 in March to April of their fourth year in school. On the average, there was an increase of only 0.49 of a grade level (or one-half a year) during the full year between achievement testing. Perhaps this is about what could be expected from a group whose mean IQ had dropped to 88.78 (see Table 3), but these data are discouraging in suggesting a trend toward the "progressive academic retardation" which has been repeatedly reported for disadvantaged children. The only children who were achieving on total language subtests at or above grade placement were those with three years of PLDK combined with ITA. This group had an unadjusted mean written language achievement grade level of 5.02. However, it must be recalled that these subjects had significantly higher initial IQ scores (see Table 2). The inferential statistics concerning which differences were significant are reported in Tables 18 through 29.

Table 15

Unadjusted Raw Score Means and Standard Deviations on Subtest and Total Scores of the Metropolitan Achievement Tests

Treatment Group	N		Total			WK			WD			R			S			L		
			Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.
Without PLDK																				
With ITA	36	$\bar{X}$	16.99	20.25	3.26	18.19	21.31	3.12	15.36	18.67	3.31	14.33	17.17	2.84	16.75	20.06	3.31	20.33	24.06	3.73
		S	8.52	8.89		10.19	8.98		8.00	7.76		6.66	7.45		12.26	12.60		10.28	11.70	
With TO	36	$\bar{X}$	18.36	23.44	5.08	18.50	22.75	4.25	16.53	20.94	4.41	14.94	18.78	3.84	19.53	24.42	4.89	22.28	30.31	8.03
		S	7.70	9.30		7.43	9.10		7.39	8.49		5.46	6.97		13.18	13.74		9.34	11.83	
Total	72	$\bar{X}$	17.68	21.84	4.16	18.35	22.03	3.68	15.94	19.81	3.87	14.64	17.97	3.33	18.14	22.24	4.10	21.31	27.18	5.87
		S	8.09	9.17		8.86	9.01		7.67	8.16		6.05	7.21		12.71	13.27		9.80	12.10	
One Year PLDK																				
With ITA	28	$\bar{X}$	17.45	20.09	2.64	18.75	21.43	2.68	15.11	18.43	3.32	14.89	16.43	1.54	16.32	19.82	3.50	22.18	24.36	2.18
		S	8.62	9.69		9.61	10.81		8.36	8.97		6.85	7.07		13.68	14.07		8.91	11.26	
With TO	28	$\bar{X}$	16.17	20.94	4.77	17.43	22.18	4.75	14.11	18.57	4.46	14.71	18.39	3.68	14.11	19.82	5.71	20.50	25.71	5.12
		S	7.89	8.91		7.99	9.85		7.84	8.41		5.74	7.73		12.25	13.58		9.11	9.38	
Total	56	$\bar{X}$	16.81	20.51	3.70	18.09	21.80	3.71	14.61	18.50	3.89	14.80	17.41	2.61	15.21	19.82	4.61	21.34	25.04	3.70
		S	8.21	9.23		8.78	10.25		8.05	8.62		6.26	7.41		12.92	13.70		8.97	10.29	
Two Years PLDK																				
With ITA	7	$\bar{X}$	22.83	25.80	2.97	24.29	24.71	0.42	17.57	23.71	6.14	16.57	14.43	1.86	25.29	30.14	4.85	30.43	32.00	1.57
		S	5.93	7.17		7.04	6.21		7.30	7.32		4.24	6.90		10.63	10.82		5.47	6.46	
With TO	14	$\bar{X}$	15.10	18.64	3.54	18.43	20.14	1.71	13.57	16.43	2.86	14.64	16.43	1.79	12.07	16.36	4.29	16.79	23.86	7.07
		S	6.55	7.60		5.18	8.81		5.81	7.72		5.85	5.26		10.59	10.85		9.92	9.23	
Total	21	$\bar{X}$	17.68	21.03	3.35	20.38	21.67	1.29	14.90	18.86	3.96	15.29	17.10	1.81	16.48	20.95	4.47	21.33	26.57	5.24
		S	7.24	8.06		6.35	8.18		6.46	8.20		5.34	5.69		12.14	12.49		10.79	9.13	
Three Years PLDK																				
With ITA	17	$\bar{X}$	28.60	33.19	4.59	31.29	36.18	4.89	26.24	29.76	3.52	23.88	27.76	3.88	30.71	34.29	3.58	30.88	37.94	7.06
		S	5.62	5.25		8.27	6.87		5.30	3.83		5.58	7.15		7.53	6.12		8.79	7.30	
With TO	20	$\bar{X}$	20.61	25.17	4.56	20.50	26.35	5.85	17.65	22.45	4.80	20.50	20.65	0.15	15.75	24.60	8.85	28.65	31.80	3.15
		S	7.15	8.24		9.11	9.94		7.65	7.77		6.82	8.90		9.33	9.66		8.94	10.46	
Total	37	$\bar{X}$	24.28	28.85	4.57	25.46	30.86	5.40	21.59	25.81	4.22	22.05	23.92	1.87	22.62	29.05	6.43	29.68	34.62	4.94
		S	7.57	8.03		10.70	9.89		7.89	7.21		6.43	8.80		11.32	9.48		8.82	9.54	
Totals																				
With ITA	88	$\bar{X}$	19.85	23.14	3.29	21.39	24.49	3.10	17.56	21.14	3.58	16.53	19.08	2.55	19.99	23.53	3.54	23.76	27.47	3.71
		S	9.02	9.81		10.62	10.67		8.66	8.69		7.27	8.30		13.04	13.26		10.13	11.75	
With TO	98	$\bar{X}$	17.73	22.39	4.66	18.59	22.95	4.36	15.64	19.93	4.29	15.97	18.71	2.74	16.14	21.99	5.85	22.29	28.38	6.09
		S	7.62	8.88		7.66	9.51		7.43	8.34		6.24	7.41		12.02	12.77		9.85	10.80	
Grand Total	186	$\bar{X}$	18.73	22.75	4.02	19.91	23.68	3.77	16.55	20.50	3.95	16.24	18.89	2.65	17.96	22.72	4.76	22.98	27.95	4.97
		S	8.35	9.32		9.26	10.08		8.07	8.51		6.73	7.82		12.63	12.99		9.98	11.24	

Table 16

Unadjusted Grade Equivalent Score Means and Standard Deviations on Subtest and Total Scores of the Metropolitan Achievement Tests

Treatment Group	N		Total			WK			WD			R			S			L		
			Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.	Post	Follow-up	Diff.
Without PLDK																				
With ITA	36	$\bar{X}$	3.04	3.41	0.37	3.12	3.40	0.28	3.19	3.54	0.35	2.89	3.21	0.32	3.63	4.07	0.44	2.38	2.85	0.47
		S	0.97	1.04		1.00	0.89		0.92	0.89		0.76	0.87		1.38	1.54		1.30	1.46	
With TO	36	$\bar{X}$	3.18	3.80	0.62	3.13	3.55	0.42	3.29	3.82	0.53	2.94	3.39	0.45	3.91	4.59	0.68	2.61	3.67	1.06
		S	0.84	1.13		0.67	0.87		0.81	1.01		0.61	0.82		1.48	1.70		1.09	1.66	
Total	72	$\bar{X}$	3.11	3.61	0.50	3.13	3.47	0.34	3.24	3.68	0.44	2.91	3.30	0.39	3.77	4.33	0.56	2.50	3.26	0.76
		S	0.90	1.10		0.84	0.88		0.87	0.96		0.69	0.85		1.43	1.63		1.20	1.61	
One Year PLDK																				
With ITA	28	$\bar{X}$	3.07	3.39	0.32	3.15	3.43	0.28	3.14	3.54	0.40	2.94	3.12	0.18	3.59	4.01	0.42	2.51	2.85	0.34
		S	0.95	1.10		0.93	1.04		0.92	1.06		0.77	0.80		1.48	1.64		1.16	1.41	
With TO	28	$\bar{X}$	2.93	3.47	0.54	3.04	3.49	0.45	3.00	3.51	0.51	2.92	3.34	0.42	3.36	4.02	0.66	2.36	3.00	0.64
		S	0.90	1.06		0.75	0.98		0.88	0.98		0.65	0.92		1.45	1.71		1.15	1.20	
Total	56	$\bar{X}$	3.00	3.43	0.43	3.09	3.46	0.37	3.07	3.53	0.46	2.93	3.23	0.30	3.48	4.02	0.54	2.44	2.92	0.48
		S	0.92	1.07		0.84	1.00		0.90	1.01		0.70	0.86		1.46	1.66		1.15	1.30	
Two Years PLDK																				
With ITA	7	$\bar{X}$	3.64	4.00	0.36	3.67	3.64	-0.03	3.36	4.09	0.73	3.13	3.31	0.18	4.47	5.16	0.69	3.57	3.80	0.23
		S	0.61	0.79		0.67	0.51		0.73	0.84		0.46	0.76		1.09	1.29		0.69	0.83	
With TO	14	$\bar{X}$	2.81	3.20	0.39	3.11	3.29	0.18	2.96	3.29	0.33	2.90	3.11	0.21	3.11	3.56	0.45	1.96	2.77	0.81
		S	0.67	0.82		0.44	0.84		0.59	0.87		0.66	0.59		1.08	1.08		1.09	1.17	
Total	21	$\bar{X}$	3.09	3.47	0.38	3.30	3.41	0.11	3.10	3.55	0.45	2.98	3.18	0.20	3.56	4.09	0.53	2.50	3.11	0.61
		S	0.75	0.88		0.58	0.75		0.65	0.92		0.60	0.64		1.24	1.36		1.23	1.16	
Three Years PLDK																				
With ITA	17	$\bar{X}$	4.31	5.02	0.71	4.42	5.05	0.63	4.42	4.96	0.54	3.98	4.61	0.63	5.07	5.81	0.74	3.68	4.67	0.99
		S	0.69	0.85		0.92	1.04		0.68	0.66		0.68	1.18		0.91	1.06		1.15	1.09	
With TO	20	$\bar{X}$	3.44	3.99	0.55	3.29	3.95	0.66	3.40	3.99	0.59	3.58	3.65	0.07	3.51	4.57	1.06	3.43	3.81	0.38
		S	0.80	1.05		0.86	1.17		0.87	0.98		0.80	1.12		0.97	1.32		1.11	1.34	
Total	37	$\bar{X}$	3.84	4.47	0.63	3.81	4.45	0.64	3.87	4.44	0.57	3.76	4.09	0.33	4.23	5.14	0.91	3.55	4.21	0.66
		S	0.86	1.08		1.04	1.23		0.93	0.97		0.76	1.23		1.22	1.35		1.12	1.29	
Totals																				
With ITA	88	$\bar{X}$	3.34	3.76	0.42	3.43	3.75	0.32	3.42	3.86	0.44	3.13	3.46	0.33	3.96	4.47	0.51	2.77	3.28	0.51
		S	1.01	1.18		1.06	1.13		0.99	1.06		0.83	1.06		1.42	1.62		1.29	1.51	
With TO	98	$\bar{X}$	3.11	3.66	0.55	3.13	3.58	0.45	3.18	3.69	0.51	3.06	3.39	0.33	3.56	4.28	0.72	2.61	3.38	0.77
		S	0.84	1.07		0.70	0.97		0.83	0.99		0.71	0.89		1.35	1.58		1.19	1.45	
Grand Total	186	$\bar{X}$	3.22	3.71	0.49	3.27	3.66	0.39	3.30	3.77	0.47	3.09	3.42	0.33	3.75	4.37	0.62	2.69	3.33	0.64
		S	0.93	1.12		0.90	1.05		0.91	1.02		0.77	0.97		1.39	1.60		1.24	1.47	

Table 17

Adjusted Raw Score Means on Subtest and Total Scores of the Metropolitan Achievement Tests

Treatment Group	N	Total		WK		WD		R		S		L	
		Post	Follow-up	Post	Follow-up	Post	Follow-up	Post	Follow-up	Post	Follow-up	Post	Follow-up
Without PLDK													
With ITA	36	16.75	19.99	17.96	21.03	15.15	18.46	14.14	16.94	16.47	19.83	20.02	23.71
With TO	36	18.51	23.60	18.64	22.93	16.66	21.07	15.06	18.92	19.70	24.57	22.47	30.53
Total	72	17.63	21.79	18.31	21.98	15.90	19.77	14.60	17.93	18.09	22.20	21.25	27.11
One Year PLDK													
With ITA	28	19.08	21.83	20.30	23.31	16.52	19.86	16.18	17.94	18.18	21.38	24.23	26.68
With TO	28	16.91	21.74	18.14	23.04	14.75	19.22	15.30	19.08	14.96	20.53	21.43	26.77
Total	56	18.00	21.78	19.22	23.17	15.63	19.54	15.74	18.51	16.56	20.96	22.83	26.73
Two Years PLDK													
With ITA	7	22.16	25.08	23.66	23.94	16.99	23.12	16.04	17.81	24.53	29.50	29.59	31.05
With TO	14	15.89	19.48	19.18	21.05	14.25	17.12	15.26	17.16	12.97	17.12	17.78	24.99
Total	21	17.98	21.36	20.67	22.02	15.16	19.13	15.53	17.38	16.83	21.24	21.71	27.00
Three Years PLDK													
With ITA	17	25.95	30.36	28.78	33.13	23.96	27.44	21.79	25.31	27.69	31.75	27.56	34.17
With TO	20	19.37	23.84	19.32	24.92	16.58	21.36	19.52	19.50	14.33	23.41	27.09	30 03
Total	37	22.39	26.83	23.67	28.68	19.96	24.16	20.56	22.17	20.47	27.24	27.31	31.93
Totals													
With ITA	88	19.71	22.99	21.25	24.32	17.44	21.01	16.42	18.95	19.82	23.39	23.58	27.26
With TO	98	17.86	22.53	18.71	23.10	15.75	20.04	16.07	18.83	16.29	22.11	22.45	28.56
Grand Total	186	18.73	22.75	19.91	23.68	16.55	20.50	16.24	18.89	17.96	22.72	22.98	27.95

The analysis of covariance on the total posttest scores for the five written language subtests of the Metropolitan Achievement Tests appears in Table 18. As was reported at the end of the three year experimental period (and confirmed in Table 18 on slightly different samples), the PLDK treatment was effective in improving school achievement, especially among the children who learned to read in combination with three years of PLDK. The ITA children were significantly superior to those who learned to read in TO. There was a tendency for PLDK plus ITA to be facilitating. Inspection of Table 18 reveals that a significant PLDK by reading method interaction was obtained. As in several of the previous analyses, significant differences between PLDK groups occurred only among the children who had been taught to read in ITA. The three-year PLDK group was significantly superior in comparison to the children who did not have PLDK training, and to those who received it for one year. The two-year PLDK group was also superior to the non-PLDK group. None of the other differences between the PLDK groups was significant. Finally, the ITA method resulted in superior achievement in comparison to the TO approach only when combined with two and three years of PLDK experience.

The analysis of covariance on the follow-up total scores for the five written language subtests is reported in Table 19. The follow-up data in Table 19 on the effectiveness of the ITA are in sharp contrast to the results obtained after the children had completed the first, second, and third grades. In past years, the ITA group was found to be significantly superior to the TO groups on academic achievement. The data reported herein reveal that, overall, the ITA treatment was

Table 18

Analysis of Covariance on the Word Knowledge Subtest of the

Metropolitan Achievement Tests--Posttest

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	2059.1019	2269.3072	1080.3759	3	360.1253	5.3435*	2.08
B (ITA vs. TO)	1	95.7602	687.1887	256.5255	564.8973	1	564.8973	8.3819*	2.71
A x B	3	577.8857	1091.3061	571.1466	838.4952	3	279.4984	4.1472*	2.08
Error	178	24217.2399	13385.1533	5938.8422	11928.7592	177	67.3941		
Total	185	28341.1582	17222.7500	9035.8215		184			

*$p < .01$

Table 19

Analysis of Covariance on the Word Knowledge Subtest of the

Metropolitan Achievement Tests--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	2720.5636	2759.9045	1272.6770	3	424.2256	5.6506**	2.08
B (ITA vs. TO)	1	95.7602	220.7347	145.3876	141.9498	1	141.9498	1.8907	2.71
A x B	3	577.8857	1054.8637	595.2365	743.9337	3	247.9779	3.3030*	2.08
Error	178	24217.2399	15443.8176	7224.6653	13288.5023	177	75.0762		
Total	185	28341.1582	19439.9796	10725.1939		184			

*p < .05
**p < .01

no longer significantly better than the TO reading treatment. However, significant differences between the PLDK groups were obtained. Furthermore, the interaction of PLDK by reading method was significant.

On the significant PLDK by reading method interaction, further analyses found that, after four years in school, the children who acquired initial reading skills using ITA were still significantly superior to those receiving reading instruction in TO only within the three-year PLDK groups. Furthermore, the children who learned to read in ITA groups and received three years of PLDK lessons made significantly more progress in written language than those children who received less PLDK experience. Among children who have been taught to read initially in ITA, those in the three-year PLDK group obtained significantly higher achievement in comparison to the children in the non-PLDK group, one-year PLDK group, and the two-year PLDK group.

Tables 20 through 29 present the analyses of covariance data on post- and follow-up testing for the five written language subtests of the MAT. An overview of what is contained in these ten tables will be presented below. In terms of the five posttest tables (Tables 20, 22, 24, 26, and 28), with a few exceptions, there was a tendency toward the following:

1. The PLDK main effects were all significant and in favor of the three-year PLDK group except on the Spelling Subtest.

2. The main effects in favor of ITA over TO were all significant except for the Reading (comprehension) and the Language (mechanics)

Subtests. The ITA group also spelled more correctly at time of post-testing in TO than did the TO group.

3. The interaction between PLDK and reading approaches was significant in all cases except for Reading Subtest with the ITA children with three years of PLDK tending to obtain the highest scores.

In terms of the follow-up test tables (Tables 21, 23, 25, and 27), with a few exceptions, there was a tendency toward the following:

1. The main effects in favor of the PLDK treatment were all significant--even on the Spelling Subtest. Apparently, three years of PLDK lessons continued to have a generalized facilitating effect upon written language achievement after the fourth year in school.

2. The main effect on ITA vs. TO was no longer significant for any of the five written language subtests. Generally, the initial superiority of ITA over TO was no longer present by the end of the fourth grade.

3. The interactions between the PLDK and reading treatments continued to be significant for each of the five subtests. Analyses continued to indicate in all cases the superiority of the three-year PLDK group which had learned to read in ITA.

For the reader who wishes more detail of the five written language subtests, Tables 20 through 29 will now be discussed in order.

The analysis of covariance on the posttest scores on the Word Knowledge Subtest appears in Table 20. Inspection of this table indicates significant main effects on PLDK levels, methods of teaching, as well as on the interaction between these two variables. Within the three-year PLDK group, children in the ITA approach to teaching reading

Table 20

Analysis of Covariance on the Word Discrimination Subtest of the Metropolitan Achievement Tests--Posttest

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	1435.0849	2141.4862	583.1848	3	194.3949	3.8267**	2.08
B (ITA vs. TO)	1	95.7602	308.7551	171.9483	235.8540	1	235.8540	4.6429*	2.71
A x B	3	577.8857	759.0055	434.8289	589.9514	3	196.6504	3.8711**	2.08
Error	178	24217.2399	10197.1137	5403.7979	8991.3185	177	50.7984		
Total	185	28341.1582	12699.9592	8152.0613	10400.3087	184			

*$p < .05$
**$p < .01$

achieved significantly higher scores when compared to those learning to read in TO. None of the other comparisons between the ITA and TO approaches were significant. Additional analyses indicated that the three-year PLDK children who were taught to read in ITA were significantly superior in comparison to those who received no PLDK, one year of PLDK, or two years of PLDK. Within the TO reading sample, none of the differences between the PLDK groups reached significance.

The analysis of covariance on the follow-up scores on the Word Knowledge Subtest appears on Table 21. Again, significant effects were obtained on the PLDK levels and on the PLDK by methods of teaching reading interaction. In contrast to the posttest analysis, no significant difference was obtained on the ITA and TO methods of teaching reading. Analysis of the interaction revealed that the children in the ITA approach were significantly superior to the TO method only in combination with three years of PLDK. Among the children who were taught to read in ITA, the three-year PLDK group was significantly superior to the non-PLDK, one-year PLDK, and two-year PLDK groups. None of the other differences between the PLDK groups who learned to read in ITA were significant. Finally, none of the comparisons between the PLDK groups who learned to read in TO were significant.

The analysis of covariance on the posttest scores on the Word Discrimination Subtest appears in Table 22. Inspection of this table reveals that significant differences were obtained on PLDK, methods of teaching reading, as well as on the PLDK by methods of teaching reading. The significant differences between PLDK groups were obtained

Table 21

Analysis of Covariance on the Word Discrimination Subtest of the Metropolitan Achievement Tests--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	1505.5054	2187.5740	619.6922	3	206.5640	3.6684*	2.08
B (ITA vs. TO)	1	95.7602	1526.6990	120.9234	102.3971	1	102.3971	1.8185	2.71
A x B	3	577.8857	929.2005	499.8895	726.7917	3	242.2639	4.3025**	2.08
Error	178	24217.2399	11210.6105	5489.0464	9966.4708	177	56.3077		
Total	185	28341.1582	13798.0154	8297.4133		184			

*$p < .05$
**$p < .01$

Table 22

Analysis of Covarience on the Reading Subtest of the

Metropolitan Achievement Tests--Posttest

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	1713.7363	2137.5296	910.7620	3	303.5873	9.3790*	2.08
B (ITA vs. TO)	1	95.7602	43.1837	64.3061	20.8439	1	20.8439	0.6439	2.71
A x B	3	577.8857	139.6207	196.6524	83.1759	3	27.7253	0.8565	2.08
Error	178	24217.2399	6737.7247	4941.8487	5729.2750	177	32.3687		
Total	185	28341.1582	8634.2654	7340.3368		184			

*$p < .01$

only among the children who had been taught to read in ITA. Within the ITA reading method, the three-year PLDK group obtained significantly higher scores in comparison to the non-PLDK, one-year PLDK, and two-year PLDK groups. None of the differences among the PLDK groups who had been taught to read in TO were significant. Furthermore, the ITA approach was significantly superior to the TO approach only in combiaation with three years of PLDK training. The differences between the two reading methods for children with less PLDK experience were not significant.

The analysis of covariance on the followup test scores of the Word Discrimination Subtest is in Table 23. Inspection of this table reveals that significant effects were obtained both on PLDK levels and on the PLDK by reading method interaction. Again, signifiaant differences appeared between the PLDK groups in combination with ITA. The three-year PLDK group was significantly superior to the non-PLDK and one-year PLDK groups. For the children who had been taught to read in TO, none of the comparisons between PLDK levels was significant. The ITA method was significantly superior to the TO method only in combination with two or three years of PLDK.

The analysis of covariance on the posttest scores of the Reading (comprehension) Subtest appears in Table 24. Significant differences were obtained between the levels of PLDK training. Comparisons between the PLDK groups revealed that the children with three years of PLDK were significantly superior to the children who received no PLDK, one year of PLDK, and two years of PLDK. No significant difference was obtained between the methods of teaching reading, and the interaction between PLDK and methods of teaching reading.

Table 23

Analysis of Covariance on the Reading Subtest of the

Metropolitan Achievement Tests--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	1338.0882	1982.2800	538.1296	3	179.3765	3.8643**	2.08
B (ITA vs. TO)	1	95.7602	27.1888	51.0255	8.2063	1	8.2063	0.1767	2.71
A x B	3	577.8857	650.8119	494.5939	441.9116	3	147.3038	3.1734*	2.08
Error	178	24217.2399	9605.4367	5800.7486	8215.9851	177	46.4179		
Total	185	28341.1582	11621.5256	8328.6480		184			

*p < .05
**p < .01

Table 24

Analysis of Covariance on the Spelling Subtest of the

Metropolitan Achievement Tests--Posttest

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	1592.0372	2266.8637	497.8525	3	165.9508	1.2617	2.08
B (ITA vs. TO)	1	95.7602	1185.3265	336.9081	990.7947	1	990.7947	7.5334*	2.71
A x B	3	577.8857	2999.1802	840.8422	2534.8854	3	844.9618	6.4246*	2.08
Error	178	24217.2399	25390.4153	7150.8248	23278.9321	177	131.5193		
Total	185	28341.1582	31166.9592	10595.4388		184			

*$p < .01$

The analysis of covariance on the follow-up test scores of the Reading Subtest appears in Table 25. Inspection of this table indicates the presence of significant differences among levels of PLDK, and a significant PLDK by methods of teaching reading interaction. In contrast to the posttest analysis, differences between PLDK levels were obtained only among the children who had been taught to read in ITA. In the ITA sample, the three-year PLDK group was significantly superior to the non-PLDK, one-year PLDK, and two-year PLDK groups. None of the differences between the PLDK groups who had been taught to read in TO attained statistical significance. Finally, the ITA approach was significantly superior to the TO method only in combination with three years of PLDK training.

The analysis of covariance on the posttest and follow-up test scores of the Spelling Subtest appear in Tables 26 and 27, respectively. Examination of Tables 26 and 27 indicates the presence a significant PLDK by methods of teaching reading interaction. The differences between PLDK levels again occurred only in combination with the ITA reading method. In both analyses, the three-year PLDK group was significantly superior to the non-PLDK, one-year PLDK, and two-year PLDK groups. Furthermore, the two-year PLDK group obtained significantly higher scores in comparison to the ITA children without PLDK experience. The ITA approach was significantly superior to the TO method within the groups which received two and three years of PLDK training.

The analysis of covariance on posttest scores of the Language (mechanics) Subtest appears in Table 28. Examination of this table

Table 25

Analysis of Covariance on the Spelling Subtest of the

Metropolitan Achievement Tests--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	2316.6107	2733.4514	1046.3932	3	348.7977	2.3977*	2.08
B (ITA vs. TO)	1	95.7602	336.9846	179.6377	252.8512	1	252.8512	1.7381	2.71
A x B	3	577.8857	2663.0483	771.7458	2300.1809	3	766.7269	5.2707**	2.08
Error	178	24217.2399	27234.5962	5999.8845	25748.1092	177	145.4695		
Total	185	28341.1582	32551.2398	9684.7194		184			

*p < .10
**p < .01

Table 26

Analysis of Covariance on the Language Subtest of the Metropolitan Achievement Tests--Posttest

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degree of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	2185.1120	2414.5873	920.4522	3	306.8174	4.2401*	2.08
B (ITA vs. TO)	1	95.7602	246.9388	153.7755	156.5709	1	156.5709	2.1637	2.71
A x B	3	577.8857	1311.3309	322.7342	1161.9561	3	387.3187	5.3526*	2.08
Error	178	24217.2399	15359.9653	7861.6582	12807.8302	177	72.3606		
Total	185	28341.1582	19103.3470	10752.7552		184			

*p < .01

Table 27

Analysis of Covariance on the Language Subtest of the

Metropolitan Achievement Tests--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	2377.1768	2780.5902	715.2015	3	238.4005	2.5515*	2.08
B (ITA vs. TO)	1	95.7602	1.3061	- 11.1837	22.4240	1	22.4240	0.2399	2.71
A x B	3	577.8857	1663.6403	544.4156	1336.7216	3	445.5738	4.7688**	2.08
Error	178	24217.2399	19818.7136	8913.8004	16537.7519	177	93.4336		
Total	185	28341.1582	23860.8368	12227.6225		184			

*p < .10
**p < .01

Table 28

Analysis of Covariance on Total Scores for the Written Language Subtests of the Metropolitan Achievement Tests--Posttests

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	42570.1628	11210.1959	17705.2478	3	5901.7492	4.6251**	2.08
B (ITA vs. TO)	1	95.7602	10014.2908	979.2704	7612.2720	1	7612.2720	5.9656*	2.71
A x B	3	577.8857	23168.0610	2354.8303	17941.0697	3	5980.3565	4.6867**	2.08
Error	178	24217.2399	266327.0518	31307.5351	225853.3332	177	1276.0075		
Total	185	28341.1582	342079.5664	45851.8317		184			

*p < .05
**p < .01

indicates the presence of significant differences among levels of PLDK, as well as a significant PLDK by reading method interaction. Analysis of this interaction revealed the presence of significant differences among the PLDK groups within both the ITA and TO reading approaches. Among children who learned to read in ITA, the one-year, two-year, and three-year PLDK groups were significantly superior to the group which did not receive PLDK training. None of the other comparisons between the PLDK groups which had learned to read in ITA revealed significance. In the TO sample, the three-year PLDK group obtained significantly higher Language Subtest scores in comparison to the groups with no PLDK, and PLDK experience for one and two years. The ITA reading method was superior to the TO method only for the children who had received two years of PLDK.

The analysis of covariance on follow-up scores of the Language Subtest appears in Table 29. Examination of this table indicates the presence of a significant effect for PLDK, as well as a significant PLDK by reading method interaction. Analysis of this interaction indicated again that the differences between PLDK groups occurred only in combination with ITA. The three-year PLDK group obtained significantly higher scores in comparison to the non-PLDK and one-year PLDK groups. Furthermore, the children in two-year PLDK group obtained significantly higher scores than those in the non-PLDK group. The difference between the performances of the two- and three-year PLDK groups was not statistically significant. None of the differences between PLDK groups who had been taught to read in TO reached statistical significance.

The following conclusions are drawn from the posttest data on the five MAT written language subtest gathered at the end of the third grade:

Table 29

Analysis of Covariance on Total Scores for the Written Lanugage

Subtests of the Metropolitan Achievement Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	49608.8289	12469.7458	19606.3068	3	6535.4356	4.0368*	2.08
B (ITA vs. TO)	1	95.7602	2450.2499	484.3928	1290.1143	1	1290.1143	0.7968	2.71
A x B	3	577.8857	30586.3699	2903.1134	23492.7114	3	7830.9038	4.8370*	2.08
Error	178	24217.2399	332719.5462	33436.1511	286555.0698	177	1618.9551		
Total	185	28341.1582	415364.9949	49293.4031		184			

*p < .01

1. Overall, the PLDK lessons facilitated written language achievement, except in the area of spelling, with three years of PLDK lessons contributing most of the effects.

2. Overall, ITA was superior to the TO approach in producing significant school achievement in written language except on the Reading (Comprehension) and Language Subtests. The ITA children were also significantly superior to the TO children on spelling performance.

3. Overall, PLDK plus ITA were facilitating, especially for those with three years of PLDK plus ITA.

The following conclusions are drawn from the follow-up data on the five MAT written language subtests:

1. After four years in school, overall, the ITA approach to teaching beginning reading did not result in superior achievement in written language when compared to the performance of children who had been taught by a conventional basal reading program in TO.

2. The ITA approach was superior to the TO approach on MAT achievement when it was combined with two or three years of PLDK exercises.

3. Overall, the three years of PLDK lessons were effective in facilitating academic achievement in comparison to children with less PLDK experience. This finding may suggest that only an extended program of oral language stimulation produces effects that continue beyond the duration of the treatment program. On the average, children with three years of PLDK were approximately one grade equivalent ahead of the other PLDK groups in their fourth year in school. The evidence appears to suggest that taking 30 minutes out of the school day for oral language stimulation does not detract from regular school achievement in written language.

Written Language Development

The written language development descriptive data obtained from Myklebust's Written Picture Story Language Test appear in Tables 30 and 31. It will be recalled the task for each subject was to write a creative story stimulated by the standard picture provided in the test kit. Whether one examines the unadjusted means in Table 30 or the adjusted means in Table 31, the data indicate, in general, a gradual trend for the children with more PLDK treatment to be superior in written language. Tables 32 through 36 indicate that, except for words per sentence, these differences achieved statistical significance.

Table 32 contains the analysis of covariance on the first measure of productivity (total words per story) on the Picture Story Language Test. Examination of this table reveals that the main effect differences on both the levels of PLDK and the methods of teaching beginning reading reached statistical significance. Furthermore, the interaction between levels of PLDK and methods of teaching reading attained statistical significance. Analysis of this interaction revealed a number of significant differences between the PLDK groups within both the ITA and TO reading methods. Among the ITA subjects, children with three years of PLDK wrote significantly more words in comparison to those with no PLDK, one year of PLDK, and two years of PLDK. None of the other comparisons between PLDK groups which had learned to read in ITA reached significance. For the TO subjects, two- and three-year PLDK groups obtained significantly higher scores in comparison to those children who did not receive PLDK.

Table 30

Unadjusted Means and Standard Deviations on the Written Picture Story Language Test

Treatment Group	N	Total Words		Total Sentences		Words/Sentence		Syntax Q		Abstract-Concrete	
		$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S
Without PLDK											
With ITA	36	96.61	56.40	11.02	6.61	8.90	2.61	87.89	7.31	11.50	4.16
With TO	36	88.36	49.67	9.56	5.47	9.89	3.15	88.36	8.58	11.11	4.68
Total	72	92.49	52.93	10.29	6.07	9.39	2.91	88.12	7.91	11.31	4.40
One Year PLDK											
With ITA	28	115.00	79.14	12.82	7.92	8.82	1.83	86.77	7.52	12.57	4.75
With TO	28	119.14	73.13	14.00	8.03	8.16	2.84	83.68	24.51	12.64	6.13
Total	56	117.07	75.52	13.41	7.92	8.49	2.39	85.22	18.03	12.61	5.43
Two Years PLDK											
With ITA	7	127.57	60.47	13.14	6.39	9.71	0.68	91.87	3.56	15.00	5.16
With TO	14	136.64	74.96	16.21	8.26	8.43	2.14	91.49	8.12	14.14	4.28
Total	21	133.62	69.05	15.19	7.67	8.97	1.85	91.62	6.84	14.43	4.48
Three Years PLDK											
With ITA	17	221.35	103.70	23.12	11.31	9.72	1.95	96.74	2.30	18.47	2.29
With TO	20	147.80	99.85	14.75	8.83	9.93	2.29	91.26	7.01	15.60	5.79
Total	37	181.59	106.87	18.59	10.76	9.83	2.12	93.78	6.00	16.92	4.70
Totals											
With ITA	88	129.02	87.28	14.10	9.15	9.10	2.16	89.56	7.42	13.47	4.87
With TO	98	116.18	75.11	12.84	7.74	9.22	2.85	88.06	14.89	12.90	5.50
Grand Total	186	122.26	81.12	13.44	8.44	9.16	2.54	88.77	11.94	13.17	5.21

Table 31

Adjusted Means on the Written Picture Story Language Test

Treatment Group	N	Total Words	Words/ Sentence	Syntax Q	Abstract-Concrete
Without PLDK					
With ITA	36	96.51	8.88	87.68	11.42
With TO	36	88.42	9.90	88.49	11.16
Total	72	92.47	9.39	88.08	11.30
One Year PLDK					
With ITA	28	115.65	8.93	88.19	13.09
With TO	28	119.44	8.21	84.33	12.88
Total	56	117.54	8.57	86.25	12.99
Two Years PLDK					
With ITA	7	127.30	9.66	91.29	14.79
With TO	14	136.96	8.66	92.18	14.39
Total	21	133.74	8.99	91.89	14.53
Three Years PLDK					
With ITA	17	220.30	9.53	94.44	17.62
With TO	20	147.31	9.84	90.18	15.20
Total	37	180.84	9.70	92.14	16.32
Totals					
With ITA	88	128.97	9.09	89.43	13.42
With TO	98	116.24	9.23	88.17	12.94
Grand Total	186	122.26	9.16	88.77	13.17

Table 32

Analysis of Covariance on Total Words of the Written Picture

Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	225996.9659	19098.8637	209400.1667	3	69800.0555	12.5775**	2.08
B (ITA vs. TO)	1	95.7602	15714.4133	1226.7091	15401.7382	1	15401.7382	2.7752*	2.71
A x B	3	577.8857	38609.0402	3454.8016	37438.3174	3	12479.4391	2.2487*	2.08
Error	178	24217.2399	982534.8613	2495.2430	982277.7620	177	5549.5918		
Total	185	28341.1582	1262855.2807	26275.6174		184			

*p <.10
**p <.01

Moreover, the one-year PLDK group demonstrated a trend toward superior performance in comparison to the non-PLDK group (t = 1.65). Finally, the ITA method children were significantly superior to the TO children only in combination with three years of PLDK training.

Table 33 contains analysis of variance statistics for the second measure of productivity (total sentences in the story). (Analysis of covariance was not performed because the within cells correlation was negative and approached zero.) Inspection of Table 33 indicates a significant main effect on PLDK and a significant PLDK by reading method interaction. Comparisons among the PLDK groups revealed the presence of significant differences within both the ITA and TO reading methods. Within the ITA method, the three-year PLDK group obtained significantly higher scores in comparison to the non-PLDK, one-year PLDK, and two-year PLDK groups. None of the remaining differences between the PLDK groups who had learned to read in ITA were significant. Among the sample who had learned to read in TO, children with one, two, and three years of PLDK experience obtained significantly higher scores in comparison to those who did not receive the PLDK training. The ITA method children were significantly superior to those who learned to read in TO only in combination with three years of PLDK.

Table 34 contains the analysis of covariance on the third and final measure of productivity, namely words per sentence. Here the main effect differences on both the levels of PLDK and the methods of teaching beginning reading failed to reach statistical significance. Furthermore, the interaction between levels of PLDK and methods of teaching reading did not attain statistical significance. The PLDK

Table 33

Analysis of Variance on Total Sentences of the Written Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	2000.0020	666.6673	10.9775**	2.08
B (ITA vs. TO)	1	140.5918	140.5918	2.3150	2.71
A x B	3	601.8398	200.6132	3.3033*	2.08
Error	178	10809.9542	60.7300		
Total	185	13552.3878			

*p <.05
**p <.01

Table 34

Analysis of Covariance on Words Per Sentence of the Written

Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	4647.6477	3734.4051	3057.5670	3	1019.1890	1.6267	2.08
B (ITA vs. TO)	1	95.7602	15.9999	-39.1429	33.2108	1	33.2108	0.0530	2.71
A x B	3	577.8857	3319.2071	-271.8835	3431.0742	3	1143.6914	1.8254	2.08
Error	178	24217.2399	111689.4923	4390.8765	110893.3737	177	626.5162		
Total	185	28341.1582	119672.3470	7814.2552		184			

appeared to result in children increasing the number of words and sentences written, but not the number of words per sentence. Words per sentence might more accurately be called a measure of sentence complexity rather than a measure of productivity as defined by "amount of writing." Much has been made of the point that one major advantage of ITA should be greater ability to write creative stories. Our study lends limited support of this contention only when PLDK and ITA are combined, and when the amount of words and sentences written is the criterion.

The analysis of covariance on grammatical correctness (syntax quotients) of the Picture Story Language Test appears in Table 35. Inspection of this table indicates the presence of significant differences only for levels of PLDK. The t-test breakdown analyses across PLDK levels indicated that the three-year PLDK children obtained significantly higher syntax quotients in comparison to those in the non-PLDK and one-year PLDK groups. Moreover, the children in the two-year PLDK group obtained significantly higher syntax quotients in comparison to those in the one-year PLDK group. No significant difference was obtained between the two-year and three-year PLDK groups. While the PLDK did not stress correct grammar, apparently the oral language stimulation lessons have a modest effect in this area--when the lessons are extended over two or three years.

The analysis of covariance on the degree of abstraction (abstract vs. concrete) scores of the Written Picture Story Language Test appears in Table 36. Again, the t-test comparison indicated that three years of PLDK lessons was significantly superior to the non-PLDK and one-year PLDK, and two-year PLDK groups. Furthermore, both the one-year and two-year PLDK

Table 35

Analysis of Covariance on Correctness (Syntax Quotient) Scores of the Written Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	213628.8648	24047.1913	113358.2861	3	37786.0953	2.9122*	2.71
B (ITA vs. TO)	1	95.7602	20143.7193	1388.8724	14326.7838	1	14326.7838	1.1041	2.08
A x B	3	577.8857	24802.2658	470.8841	25577.7438	3	8525.9146	0.6570	2.71
Error	178	24217.2399	2418963.8185	54438.6900	2296589.3869	177	12975.3812		
Total	185	28341.1582	2677538.6684	80345.6378		184			

*p< .10

Table 36

Analysis of Covariance on Abstract-Concrete Scores of the Written Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	976.3196	1254.6545	758.4138	3	252.8046	11.1327*	2.71
B (ITA vs. TO)	1	95.7602	50.0046	69.1989	39.0579	1	39.0579	1.7199	2.08
A x B	3	577.8857	67.8140	174.6991	42.2181	3	14.0727	0.6197	2.71
Error	178	24217.2399	4185.0200	2003.1057	4019.3351	177	22.7081		
Total	185	28341.1582	5279.1582	3501.6582		184			

*p < .01

groups were significantly superior on degree of abstraction scores in comparison to the children who did not receive PLDK.

The following conclusions are drawn from the written language analyses:

1. On all measures of written language, except for words per sentence, the PLDK exercises tended to facilitate performance with the three-year PLDK children tending to obtain the highest scores.

2. Overall, the ITA-trained children were not superior to the TO-trained children, except in total words in the story.

3. In two out of the five tests only (total words, and words per sentence), the ITA plus PLDK combination resulted in the highest performance.

Oral Language Development

The Oral Picture Story Language Test was a project-designed measure made to parallel Myklebust's Picture Story Language Test. As mentioned earlier, the subjects were again presented with a picture, but this time asked to tell their story orally to the examiner, who in turn tape recorded them. Two measures were obtained--productivity and level of abstraction. (There was no written story upon which to obtain a measure of grammatical correctness which included punctuation, etc.)

The unadjusted and adjusted means on productivity (total words, total sentences, and words per sentence), and degree of abstraction (abstract vs. concrete) scores of the Oral Picture Story Language Test appear in Tables 37 and 38, respectively. Again, as with the written language measure, there appeared to be a trend for those children

Table 37

Unadjusted Means and Standard Deviations on Scores from the Oral Picture Story Language Test

Treatment Group	N	Total Words		Total Sentences		Words/Sentence		Abstract-Concrete	
		$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S
Without PLDK									
With ITA	36	102.67	44.65	10.97	4.31	9.32	1.73	11.22	3.33
With TO	36	92.44	42.90	9.50	3.88	9.80	2.20	11.06	2.97
Total	72	97.56	43.78	10.24	4.14	9.56	1.98	11.14	3.13
One Year PLDK									
With ITA	28	139.79	94.17	14.96	8.99	9.35	2.16	11.79	3.30
With TO	28	97.07	44.81	10.79	5.22	9.07	1.85	12.21	2.51
Total	56	118.43	76.18	12.88	7.58	9.21	2.00	12.00	2.92
Two Years PLDK									
With ITA	7	225.14	191.95	23.00	20.73	8.59	3.45	15.14	4.63
With TO	14	158.00	101.67	15.43	9.97	10.36	1.58	12.64	3.23
Total	21	180.38	137.20	17.95	14.39	9.77	2.43	13.48	3.83
Three Years PLDK									
With ITA	17	161.76	99.93	15.00	7.52	9.89	2.76	14.94	2.77
With TO	20	182.40	155.57	16.00	12.33	11.02	2.08	16.10	2.86
Total	37	172.92	131.61	15.54	10.28	10.50	2.45	15.57	2.84
Totals									
With ITA	88	135.64	95.73	13.98	9.13	9.38	2.23	12.43	3.65
With TO	98	121.49	93.76	12.04	7.99	9.92	2.09	12.64	3.37
Grand Total	186	128.18	94.71	12.96	8.58	9.67	2.17	12.54	3.50

Table 38

Adjusted Means for the Oral Picture Story

Language Test--Follow-up

Treatment Group	N	Words/Sentence	Abstract-Concrete
Without PLDK			
With ITA	36	9.31	11.16
With TO	36	9.81	11.10
Total	72	9.56	11.13
One Year PLDK			
With ITA	28	9.42	12.19
With TO	28	9.10	12.39
Total	56	9.26	12.29
Two Years PLDK			
With ITA	7	8.56	14.97
With TO	14	10.40	12.84
Total	21	9.78	13.56
Three Years PLDK			
With ITA	17	9.77	14.29
With TO	20	10.96	15.79
Total	37	10.42	15.10
Total			
With ITA	88	9.37	12.39
With TO	98	9.93	12.67
Grand Total	186	9.67	12.54

receiving more PLDK to have higher scores--with some reversals between the two- and three-year PLDK groups. The analyses of variance and covariance are reported in Tables 39 through 42.

Table 39 contains the analysis of variance on the first measure of productivity (total words per story) on the Oral Picture Story Language Test. (Covariance was not performed because the within cells correlation was negative and approached zero.) Examination of this table reveals that the main effect differences on levels of PLDK reached statistical significance. However, the other main effect--method of teaching beginning reading--as well as the interaction were not significant. The t-test comparisons indicated the absence of significant differences between groups receiving no PLDK and one year of PLDK, as well as between two- and three-year PLDK groups. However, those with two and three years of PLDK did significantly better than those with no PLDK and one year of PLDK training.

Table 39

Analysis of Variance on Total Words of the Oral Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	205492.7447	68497.5815	8.4229*	2.08
B (ITA vs. TO)	1	12384.5102	12384.5102	1.5228	2.71
A x B	3	31235.0929	10411.6976	1.2802	2.08
Error	178	1447541.9176	8132.2579		
Total	185	1696654.2654			

*p <.01

Table 40 contains analysis of variance statistics for the second measure of productivity (total sentences in the story). (Covariance was not performed because, again, the within cells correlation was negative and approach zero.) Inspection of Table 40 indicates significant main effects for both PLDK and methods of teaching reading. The PLDK by reading method interaction did not reach statistical significance. The ITA group was significantly superior to the TO group on total sentences. Analyses of the differences among the PLDK groups revealed that both the two- and three-year PLDK groups were significantly superior to the one-year and non-PLDK groups. The one-year PLDK group, moreover, obtained significantly higher scores in comparison to the non-PLDK group. The two-year PLDK children were significantly superior to those who received one-year of PLDK. No significant differences, however, were obtained between the three-year PLDK children and those with one and two years of PLDK training.

Table 40

Analysis of Variance on Total Sentences of the Oral Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	1333.2149	444.4049	6.4515**	2.08
B (ITA vs. TO)	1	204.0816	204.0816	2.9627*	2.71
A x B	3	224.7251	74.9083	1.0874	2.08
Error	178	12261.2438	68.8833		
Total	185	14023.2654			

*p <.10
*p <.01

Table 41 provides the final measure of productivity, namely words per sentence. Inspection of Table 41 indicates that PLDK failed to reach statistical significance, whereas the two methods of teaching beginning reading were found to differ significantly. The interaction between levels of PLDK and methods of teaching reading did not attain statistical significance. The TO children were significantly superior to those who learned to read in ITA on number of words per sentence. No explanation is offered for the superiority of the TO group to the ITA group on words per sentence. The PLDK appeared to result in children increasing the number of written words and sentences, but not on the number of words per sentence.

Analysis of covariance on degree of abstraction scores on the Oral Picture Story Language Test appears in Table 42. Inspection of Table 42 reveals the presence of significant differences only among levels of PLDK. The t-test subanalyses among the PLDK groups indicated that the three-year PLDK group was significantly superior to the non-PLDK, the one-year PLDK, and the two-year PLDK groups. Moreover, the two-year PLDK group was significantly superior to the non-PLDK group, but not in comparison to the one-year PLDK group ($t = 1.65$). Finally, the one-year PLDK group obtained significantly higher abstract-concrete scores in comparison to the children who did not receive PLDK.

The following conclusions are drawn from the oral language test analyses:

1. On the oral language test, experience with the PLDK lessons enhanced productivity when measured by total words, and total sentences, but not words per sentence.

Table 41

Analysis of Covariance on Words Per Sentence of the Oral Picture

Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	3301.0602	3313.2713	2275.3089	3	758.4363	1.6587	2.08
B (ITA vs. TO)	1	95.7602	1422.3672	-369.0613	1502.8574	1	1502.8574	3.2868*	2.71
A x B	3	577.8857	1883.2073	-1035.6856	2080.8669	3	693.6223	1.5170	2.08
Error	178	24217.2399	81252.3653	2793.9756	80930.0206	177	457.2317		
Total	185	28341.1582	87859.0000	4702.5000		184			

*p < .10

Table 42

Analysis of Covariance on Abstract-Concrete Scores of the Oral Picture Story Language Test--Follow-up

Source of Variation	Degrees of Freedom	Sum of Squares X	Sum of Squares Y	Sum of Products XY	Corrected Sum of Squares Y	Degrees of Freedom	Mean Square	F Ratio	$F_{.90}$
A (PLDK)	3	3450.2724	552.5720	995.1332	417.7410	3	139.2470	15.2875*	2.08
B (ITA vs. TO)	1	95.7602	0.0204	1.3979	0.2322	1	0.2322	0.0254	2.71
A x B	3	577.8857	50.5974	37.4745	48.1678	3	16.0559	1.7627	2.08
Error	178	24217.2399	1711.2184	1548.4026	1612.2166	177	9.1085		
Total	185	28341.1582	2314.4082	2582.4082		184			

*p < .01

2. ITA was superior to TO on total words, while the TO group was superior to the ITA group on words per sentence. On the other two measures of oral language, there were no differences between the ITA and TO groups.

3. There was no significant interaction between ITA and PLDK on any of the measures obtained by the Oral Picture Story Language Test.

Summary and Conclusions

The Cooperative Language Development Project (CLDP) was a study to investigate, with Southern disadvantage children in the primary grades, the efficacy of the Initial Teaching Alphabet (ITA) in teaching beginning reading, and Levels #1, #2, and #3 of the Peabody Language Development Kits in stimulating verbal intelligence, creative thinking, school achievement, and language development. The experiment proper extended over the first three elementary grades when the posttest measures were obtained. The children were followed up through their fourth grade. The posttest and follow-up evaluation measures were obtained on eight groups of subjects[5]: (1) Group 1 received ITA but no PLDK; (2) Group 2 received ITA plus one year of PLDK; (3) Group 3 used the conventional reading approach (TO) plus PLDK for one year; (4) Group 4 received ITA plus two years of PLDK; (5) Group 5 received TO plus two years of PLDK; (6) Group 6 used ITA plus three years of PLDK; (7) Group 7 used TO plus three years of PLDK. An eighth group consisting of control subjects was

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[5]There were a number of other treatment groups involving "type instructors" and "size of group" which were dropped in the follow-up because no significant differences were found on these dimensions earlier in the project.

taught reading by means of the conventional basic reader approach and received no PLDK experience.

Pupil progress was measured in the following areas: 1) general intellectual functioning as measured by IQ scores on the 1960 Stanford-Binet Intelligence Scale (SB), 2) hearing vocabulary as measured by Vocabulary Quotient (VQ) scores on the Peabody Picture Vocabulary Test (PPVT), 3) creative thinking as measured by raw scores on the Verbal Subtests of the Torrance Tests of Creative Thinking, 4) school achievement in written language as measured by grade equivalent and raw scores on five of the subtests from the Elementary Battery of the Metropolitan Achievement Tests (MAT), 5) written language facility as measured by productivity, syntax, and degree of abstraction raw scores on Myklebust's Written Picture Story Language Test, and 6) oral language facility as measured by productivity and degree of abstraction raw scores on a project-designed Oral Picture Story Language Test.

The post- and follow-up test analyses utilizing analyses of variance and covariance on the final sample of 186 subjects (with *t* tests to breakdown main effects and interactions) revealed the following major results:

1. Overall, the PLDK lessons enhanced significantly IQ scores on the 1960 Stanford-Binet Intelligence Scale by the time of posttesting when the experimental phase terminated at the end of the third grade. The significant IQ gains were also retained in follow-up evaluation at the end of the fourth grade; the ITA group with two or three years of PLDK lessons, however, had lost significantly in IQ points from post to follow-up testing. As anticipated, neither method of teaching reading (ITA or TO) had significant effects on IQ scores at post or follow-up testing.

2. Overall, at the end of the three-year experimental period, the hearing vocabulary (as measured by the Peabody Picture Vocabulary Test) was not different at posttesting among PLDK treatment groups, or between the two reading approaches. In the follow-up evaluation one year later, the ITA group with one year of PLDK lessons made a large, but probably spurious gain in hearing vocabulary.

3. As measured by the verbal subtests of the Torrance Tests of Creative Thinking, overall, at the end of the three-year experiment, the three-year PLDK groups scored significantly higher on this attribute but their advantage was lost in follow-up.

4. On the five written language subtests of the Metropolitan Achievement Tests, overall, the children who learned initially to read utilizing ITA were generally superior to the TO groups at posttesting but essentially all of the differences in school achievement were lost at follow-up testing, except for those who had received ITA in combination with two or three years of PLDK exercises.

5. On Myklebust's Written Picture Story Language Test, the PLDK exercises tended to facilitate success, especially for the groups with three years of PLDK lessons; generally, the ITA-trained children were not superior to the TO-trained subjects.

6. On the project-designed Oral Picture Story Language Test, generally the PLDK lessons enhanced both productivity and degree of abstraction scores. The comparisons between the methods of teaching reading were uninterpretable.

In spite of some substantial and statistically significant decrements during the follow-up year, the results provide some

optimism about the effectiveness of both the PLDK lessons and the ITA reading approach with Southern disadvantaged children. However, a bias in selection of the pupils, teachers, and schools in favor of the experimental treatments, as well as the Hawthorne Effect, may have contributed as much or more to the obtaining of positive results as the PLDK and ITA approaches. To test this, the project staff initiated the two-year Cooperative Reading Project (CRP)[6] one year after the Cooperative Language Development Project was begun. The same type of disadvantaged children in the same inner city were used in both investigations. In this second CRP study, three experimental reading treatments were used: 1) the Initial Teaching Alphabet, 2) the Words-in-Color program, and 3) a supplemented conventional reading program consisting of a basic reader plus the Hay-Wingo phonic materials. In addition to the reading treatments, some of the experimental subjects also received oral language stimulation through the Peabody Language Development Kits for one or two years. The results of the Cooperative Reading Project did not confirm the positive results obtained for ITA and PLDK in the Cooperative Language Development Project. Therefore, the reader of this follow-up report is cautioned against uncritically accepting the findings reported herein.

Perhaps a final comment is in order. In light of the contrasting findings between the Cooperative Language Development Project and Cooperative Reading Project, after devoting four years to these two investigations, the researchers involved were forced to conclude that, without controlling for differences in teacher effectiveness, future studies which attempt to discern the relative effectiveness of different methods of teaching beginning reading and/or oral language will probably

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[6] See the three relevant reports in the list of references at the end of this paper under Dunn et al., 1967, 1968, 1968.

continue to be in danger of providing spurious results. Either such comparisons of different interventions should be discontinued until more is known about measuring and controlling for differences in teacher effectiveness, or research designs should be used in which the teacher is kept constant across treatments. This might necessitate the use of some type of of counter-balanced design in which a group of teachers would use one method for one or more years, and a different method (with comparable children) for another one or more years. Another approach would be for the same teachers to teach two or more experimental programs in the same day with different groups of subjects. In any event, until more sophisticated procedures and/or measures are available, it does not seem to be feasible to engage in additional teaching method studies.

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